MARINE REVIEW

Entered at Cleveland Post Office as Second-class Mail Matter.

VOL. XXII. Published every Thursday at 418-19 Perry-Payne Bldg., by the Marine Review Pub. Co. CLEVELAND, O., SEPT. 13, 1900. Subscription $3.00 a year. Foreign $4.50 a year. No. 11

ANOTHER AMERICAN SHIP YARD.

THE MODERN WORKS OF THE NEW YORK SHIP BUILDING CO., AT CAMDEN, PLANNED AND BUILT BY HENRY G. MORSE, ARE READY TO BUILD ANY KIND OF VESSEL.

An official announcement from the New York Ship Building Co. of Camden, N. J., is to the effect that its plant is now practically completed and that the company is ready to undertake orders for the construction of war vessels, ocean liners, cargo ships, coasting steamers, yachts, etc. In point of modern equipment this works undoubtedly leads the world. It would pay anyone interested in ships to make a trip to Camden from any part of the United States simply for the purpose of visiting this ship yard. The massive steel buildings extending over all the ship ways, so as to provide for the construction of all hulls, no matter how large, under cover, excite the wonder of everybody visiting this very large plant. Dr. Francis Elgar of London will occupy the position of consulting naval architect with the new company. The officers are: President, Henry G. Morse; treasurer, Capt. William G. Randle; general superintendent, R. L. Newman; secretary, George L. Brown; purchasing agent, Charles L. Hull.

The plant comprises works for the complete construction of a ship—engines, boilers, hulls and joinery. It is located in the harbor of Philadelphia, at the southern end of Camden, N. J., and within forty minutes ride of the railway stations of Philadelphia. Its annual capacity when fully employed will very probably be considerably greater than any yard in this country. The tract of land comprises 130 acres with a frontage on the Delaware river of 3,600 ft.; floor space of all buildings, 22 acres; lineal feet of dock front, 3,100; depth of water on either side of fitting out slips, 30 ft. at low tide. The building slips are so arranged that at the present time hulls 700 feet long can be built, and sufficient extension can be added to build any length of hull required. The plant has been constructed entirely fireproof; all material will be handled by traveling cranes; all machinery is new, and of the most modern type, and many special tools have been constructed and installed.

The machine shops of the Bethlehem Steel Co. at South Bethlehem, Pa., and the General Electric Co. at Schenectady, N. Y., are establishments that are talked of in all parts of the world on account of the great number of tools of all kinds enclosed within their walls, but these shops are no more wonderful than the great structure just built up at Camden. Independent motors are found everywhere and the power plant is therefore of unusual interest. The special feature is the almost exclusive use of electricity as a medium for power transmission. This power plant consists of two 500 kw. mono-cycle generators, which also furnish current for lighting, and which are directly connected by two 750 H.P. Rice & Sargent engines, running at a speed of 120 revolutions per minute. This speed, which may be considered high by many, offers many advantages for a plant of this nature, giving higher electrical efficiency and more economical use of steam. The engines and generators, being reduced in size, take up less floor space, which is always desirable. The Providence Engineering Works are the builders of the Rice & Sargent engine.

REAR ADMIRAL MELVILLE ON PORT HOLES.

Editor Marine Review: I am pleased to read in your issue of Aug. 30 the continuation of the discussion of large vs. small air ports—both at home and abroad. In the particular case of this catastrophe on the North German Lloyd liners, the objection to the agitation of the question comes not so much from any objection being made to actually needed reforms, as from the idea of preventing the loss of large sums of money, through the courts, for damages, on all sides, on the score of negligence or the absence of proper precautionary measures for the saving of life, etc. It is an easy matter for either ship builders, ship owners or insurance companies, to juggle with words and to make all sorts of excuses for not having, not only air ports, but all other means of ingress or egress, of proper proportions, consistent with, in case of necessity, the saving of life. It is ridiculous for any ship builder or engineer to say that the cutting of an elliptical air port in a ship's side, with its minor axis vertical, its major axis longitudinal, will weaken a ship beyond that of a circle of its minor diameter. Then again, it is not necessary to discuss the many ways of reinforcing such an opening, by means of stiffening plates. The whole question lies in the fact that the first construction is cheap; and that the second construction, although answering the possibilities of saving life, costs a little more money to do the work.

Furthermore, it is not necessary to make all of the air ports of large dimensions—one on each side or two on each side, in each compartment, would be sufficient to let every soul pinned below escape from between decks. In the case of the Saale, more than a hundred lives perished. It is well known in our marine boiler work that a Scotch boiler, with an elliptical manhole 11 in. by 13 in. will admit the passing through of a man with his clothing on, up to the weight of 200 lbs. It seems ridiculous that this question should be agitated at all. In fact, as I have looked upon the problem all along, it is one whose proper solving is perfectly consistent with due protection of life, while at the same time securing all the objects generally sought when designing and constructing such ports. The problem now, granting no loss in structural strength, is not so much what the original idea was when constructing these air ports, as, on the score of humanity, to prevent the recurrence of such a frightful catastrophe in case of fire, to which accident, one time or another, all ships are liable. Let the ship builder, the ship owner and the insurance man make up their minds that the necessary means of saving life is of infinitely more importance than that of saving either money or insurance, and the question will at once be solved.

GEO. W. MELVILLE,
Engineer-in-Chief, Rear Admiral, U. S. Navy.

Washington, D. C., Sept. 5, 1900.

LAKE SHIPS FOR ATLANTIC SEABOARD TRADE.

In explanation of the various statements about lake vessels engaging shortly in Atlantic trade, it may be said that there are now built and building on the great lakes some fifteen steel vessels that are of dimensions equal to the full capacity of the Canadian locks in the St. Lawrence river and which might readily make the passage to the Atlantic seaboard. The capacity of this type of vessel is about 3,000 tons on 18 ft. draught. Of course in the passage of the St. Lawrence they could carry only part cargo, and on account of the 14-foot limit of draught in the St. Lawrence locks it is not expected that there would be any profit for any of them in trade to and from the seaboard. Some of these vessels, which have been in operation during two or three years past on the lakes, are not fitted in engine departments with the surface condensers required on salt water, but those built within the past year and others now building are not only fully equipped in this regard, but were designed, from a structural standpoint, for ocean service. This is especially true of the steamer Tampico, owned by Messrs. Hawgood of Cleveland, as well as eight or ten vessels now under construction at the works of the American Ship Building Co. for two new steamship companies represented by A. B. Wolvin of Duluth, who is associated with American Steel & Wire interests, and Charles Counselman of Chicago, who is well known as a leading grain merchant of the country. These vessels will certainly go to the Atlantic coast, some of them before the close of navigation this season, and make a trial of the trade to Porto Rico and South American ports. It is not intended to have them engage in transatlantic trade. They were not built with that end in view, but it is hoped that they will be the forerunners of a large fleet of medium-size vessels built on the lakes for Atlantic seaboard trade, and built on the lakes because they can be built here cheaper than on the seaboard. Neither is it intended to seek profit in operating them between the lakes and the seaboard, or between the lakes and foreign ports, as there could be no profit in such a trade, because of the limited draught in the St. Lawrence. Probably some of them will be on the lakes in the summer and on the Atlantic seaboard during the winter, or in either trade for the full year, according to the judgment of their owners regarding the freights that are offered. When these ships reach New York the vessel men of that city will see a type of craft much superior to the old wooden barges that were sent from the lakes to the seaboard in an emergency two years ago to engage in the coal trade from Newport News to New York and Boston. They will see vessels quite well suited to almost any kind of freight service. Freights now prevailing on the Atlantic seaboard are thought to be sufficiently high to make the venture of the lake builders a complete success. The first vessel to leave, about the first of November, will probably be the Cleveland steamer Tampico. Her owners, the Messrs. Hawgood, are now in New York endeavoring to arrange a charter for her for the coming winter.

CHESAPEAKE A COMPLETE SUCCESS.

For many years, until recently, the only means which were provided at the naval academy for training cadets in seamanship were the old sailing frigate Constellation and two or three of the equally ancient sloops of war. These vessels were worn out and unserviceable for any purpose, and a few years ago the machinery was removed from the Monongahela, one of the steam sloops built during the civil war, and she was fitted as a sailing ship, but was at the best a makeshift and was also worn out. Seamanship, while it has passed out of practical use in fighting ships, bears the same relation to the training of a naval officer that the classics do to a liberal education. It is an indispensable foundation. In 1897 the superintendent of the naval academy asked congress, through the secretary of the navy, to authorize the construction of two sailing ships for training purposes. The congress then in session provided for one "composite training vessel propelled by steam and sail," and appropriated $250,000 therefor. This was subsequently modified by striking out the word "steam" and reducing the appropriation to $125,000. The result is the Chesapeake which was put in commission last fall and is now in service. She is a splendid vessel and thoroughly well fitted for her service, being modeled after the type of the best class of sailing ships in their best days, and is the only sailing ship that the United States government has launched since the construction of the Sabine in 1855. In a structural sense she is thoroughly up to date, being a steel ship constructed in accordance with the most approved modern practice, and furthermore, she is the first sheathed ship that the United States has constructed, the gunboats of the Annapolis class being of composite construction. The sheathing is perfect and will add greatly to the value of the ship.

That the design of the vessel, which was due to Chief Constructor Hichborn, was most successful, is demonstrated by the language of her commanding officer in his last quarterly report. He says:

"The ship is a fine sailing vessel; speedy, handy in working to windward, and so far as has been observed, easy in a sea-way. The Chesapeake has done 11 knots practically on the wind, all sails set to royals, heel 14 degrees."

She has not experienced any severe weather on her cruise, but the fact that she possesses ample stability has been fully demonstrated. It is also reported that she rides easy at her anchors. She is fitted with small boilers for supplying steam to the heating, lighting and ventilating plants. She is 175 ft. long on the water line, 37 ft. beam, and draws 16½ ft. of water, with a displacement of 1,175 tons. Her full ship rig includes three royal yards and 19,975 sq. ft. of sail. The lower masts are of steel, the remaining spars being of wood. She carried a battery of six 4-in. rapid-fire guns; four 6-pounders, and two 1-pounders. The superintendent of the naval academy is very much pleased with the vessel and has stated that she will make the greatest acquisition to the training facilities of the naval academy in its history. She has just returned from her first summer cruise with the class of cadets and has in all respects performed admirably.

THE FLOATING DRY DOCK.

BY LYONEL CLARK, OF THE BRITISH FIRM CLARK & STANDFIELD, DESIGNERS OF THE LARGEST FLOATING DOCKS IN THE WORLD.*

A very characteristic development of a war navy of the present time is not only the great increase in the size of the vessels of which it is composed, but more especially the great diversity in the dimensions of these units, owing to the prevailing custom of including therein the largest of the ocean liners as auxiliary cruisers. This development has naturally brought in its train a similar development in the size of the dry docks, which have always been a necessary adjunct to any fleet. Indeed, with a modern fleet, the dry dock is of greater necessity than ever, for, not only does the material of which ships are now built more rapidly suffer from want of inspection and protective covering, but their speed—so important a factor in the fighting value of a fleet—will rapidly deteriorate unless their bottoms are frequently cleaned. Up to the present time the more generally adopted method of getting at the under water portion of a ship has been the masonry graving or sunk dock. This is essentially a containing vessel, and as such its dimensions must be, in every direction, in excess of those of the ship it is destined to accommodate. An examination of a list of the different vessels that compose a modern navy will show how diversified are the dimensions in its units. Taking the question of length, although the generality of the line-of-battle ships do not attain 500 ft., yet the same fleet which possesses these vessels may also include auxiliary cruisers whose length will exceed 700 ft.

The Floating Dry Dock for Bermuda.

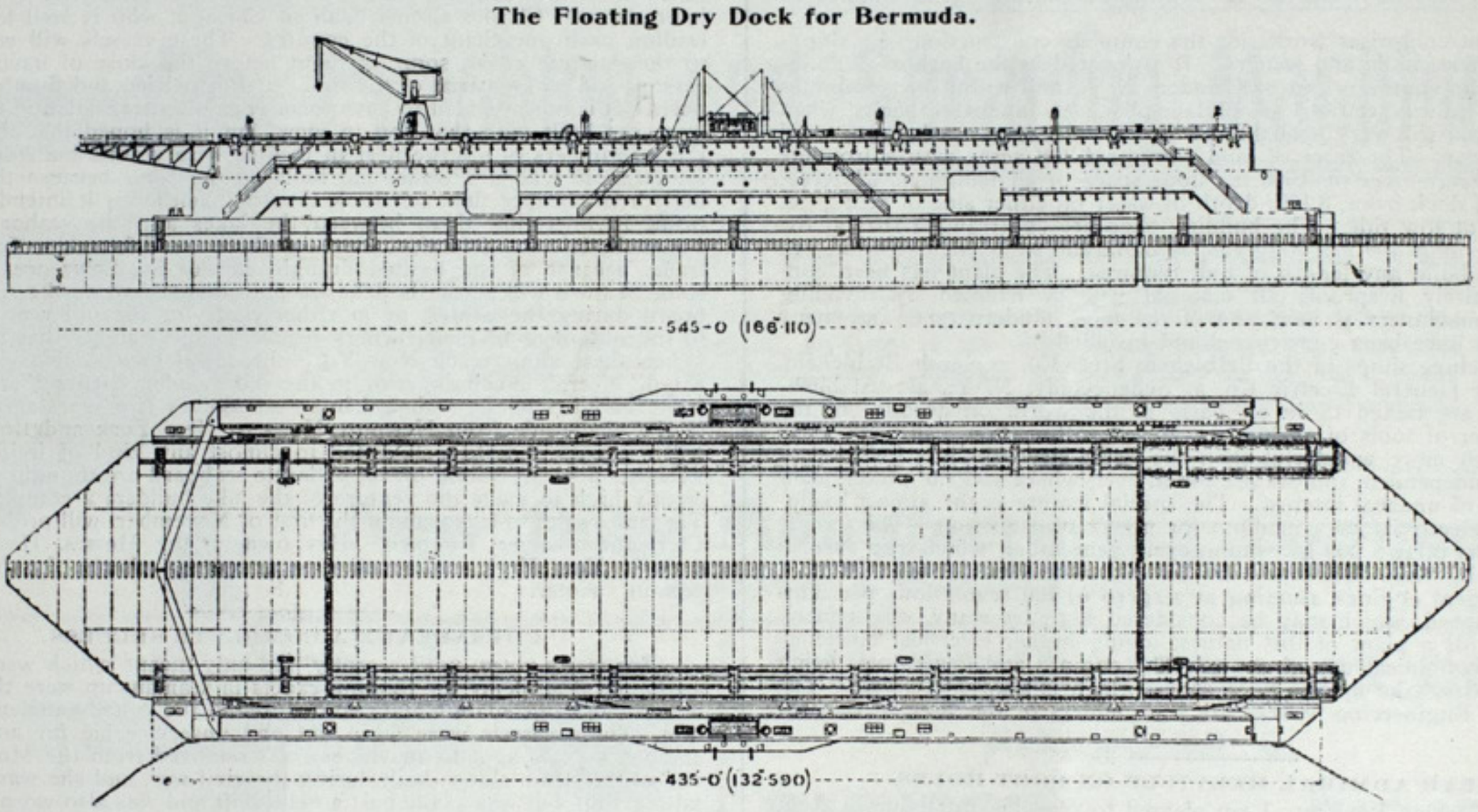


Fig. 1.

In beam, whilst about 75 ft. may be taken as a normal figure, still vessels are found of a width of over 78 ft. In draught, while somewhere about 28 ft. appears to be the usual figure for ironclads in fighting trim, there are cases where this is increased to over 31 ft. The type of vessel of the present day, therefore, that the engineer has to consider when designing his dock is one of a length of over 700 ft., a beam of over 78 ft. and a draught of over 31 ft.

The dock itself, however, seeing that it has to contain such ships, must have still larger dimensions. In length, owing to the shaped ends of a modern ship, no great clearance is needed, but at the same time there is nothing to show that 700 ft. is the length record that will remain unbroken even for the time it would take to build a graving dock, and the engineer who designed one with a less length than 750 ft. would show but little foresight. In beam the dimensions of existing basins and entrances would fairly seem to promise that but little increase is to be looked for in this direction, still a good deal of clearance is required for a dock if it is intended that any work is to be done on the ship placed in it. It may be said that 5 ft. each side would be the least practical working room, but bearing in mind the advantages of the free circulation of air and light round the vessel, it is not surprising that 10 ft. is more usually allowed, so that in an ideal dock the width of the same should not be less than 100 ft. It is true that the entrance itself may be of less width than this, but nevertheless in the body of the dock itself this width is not only required at the coping, but, owing to the square bilges and the protecting bilge keels of the modern vessel, it must be carried right down to the sill or even floor of the dock. It is no longer sufficient, as in the days of vessels with sharp rise of floors, to build a narrow invert with well battered sides, or it may be found—as indeed has been the case in America—that many even recently built graving docks, although fully wide enough at the water level, are quite unable to take in the modern ironclads on account of their bilge keels fouling the altars.

The question of depth of water over the sill or keel blocks is of still greater importance. It is not sufficient in a naval dock to allow the ship a nominal clearance under normal conditions; the docking of vessels in a more or less damaged state must be looked for, especially in times of war, and considerable provision should be made for increased draught. There seems to be a generally accepted idea than an addition above the fighting draught of about 5 ft. 6 in. represents the limit at which an ironclad could float and still retain stability, but unless such clearance be combined with a wide entrance of dock, it is doubtful whether even this depth is sufficient. In a paper which the author had the privilege of reading before the naval architects in 1896, he drew attention to a fact since emphasized by Mr. Laird Clowes in an article in the Fortnightly Review of May, 1897, namely, the possible difficulty of getting a damaged vessel of large size into even a modern stone dock. It was pointed out that if such a vessel were down by the head as little as 3 ft., this, combined with a list of five degrees, would make her bilge keels foul the entrance even of the largest and most modern docks then existing. The position of the sill does not, however, give the complete depth required for the dock. A modern flat-bottomed vessel requires to be placed on keel blocks at least 4 ft. high if work is to be freely carried on under her bilges; added to this, in tidal ports at least, a further allowance should be made in order that a vessel may be docked at all states of the tide. This is a point which has not yet—or at least not in the case of graving docks—obtained the attention it deserves. It is too commonly the practice to be content with docking vessels only at high water, and even in some cases only at the top of spring tides. War is no respecter of persons or machines, and, apart from the great advantage that must always obtain in being able to at once dock a war vessel and put the repairs in hand at any time, there is, in addition, the danger that a prolonged wait for a suitable tide may, when one considers the possible state of a vessel after a severe fight, make it doubtful whether it could remain afloat until the tide suited. Rise and fall of tide is naturally a varying quantity in different localities, but it may be asserted that a dock that could not accommodate a lame duck from half flood to half ebb, at the very least, could not be said to properly fulfil its requirements. In the case of English docks this would mean that their normal 33 ft. of water over the blocks at ordinary high springs should be increased to about 43 ft.

SIZE OF A MODERN NAVAL DOCK.

We are now in a position to see what should be the size of a modern naval dock. It should have a length of 750 ft., a beam of 100 ft. and a depth over the bottom of 47 ft. It is hardly necessary to point out that to construct such a dock with an invert 100 ft. wide and nearly 50 ft. below water level would be a serious undertaking. The thickness of the invert of the Portsmouth docks which have only 33 ft. of water over the sill is about 15 ft., so that there would be a hydrostatic pressure over the whole of this broad invert of about 30 lbs. per square inch. It is not, therefore, surprising to find that existing docks have been chiefly constructed to take vessels only at high water, and one can understand why so many of them had the narrow invert and greater batter of side walls which rendered them, although when viewed from above appearing everything desirable, quite useless for modern vessels. To construct an ideal dock as above described even in good soil would be a task that an engineer would approach with caution, whilst in made land its construction, if not impossible, would certainly be impracticable. But whilst the art of ship building has been making the remarkable progress so strongly characteristic of the present age, other kindred industries, in accordance with that great law of nature which seems to ordain that progress shall go forward equally, have been advancing, using for their ends the same knowledge, the same productions and the same tools. Amongst others, one structure which has kept its place closely in line with modern development of ship building is the floating dock. The author's firm, Messrs. Clark & Standfield, have, for a period that now nearly approaches the

* Paper read at International Congress of Naval Architecture, Paris Exposition.

half century, made a specialty of these structures, and have seen them develop from the small timber and iron pontoon up to the large steel floating docks of the present day with an area of nearly an acre and a half, and capable of dealing with the largest vessel at present built or building, and what is perhaps more satisfactory for them is that they have seen the gradual growth in the number of docks under construction from a very modest beginning until the present time when they have in their offices the plans of docks now being built whose aggregate lifting power nearly totals up to 50,000 tons.

The better the floating dock is known and examined, the greater will appear its advantages. It has its limitations, of course, but so has every other construction, and the best dock is the best compromise between such limitations. There is, perhaps, an inclination to look on a floating dock with a large ship on it as a somewhat unstable combination, and in the past some of the older docks certainly did suffer from this defect. But this was rather due to want of knowledge than to any fault in the principle of the dock, and it is evidently as easy a thing to endow a dock with any desired amount of stability as it is to perform the same operation for a battleship. Floating docks have also been frequently accused of want of stiffness or rigidity. Whilst the author cannot refrain from remarking that if there is any structure in the world that should not require a rigid bed it is the ship that passes its whole existence in the very unstable medium of the sea, and that such is practically the case is fully demonstrated by the successful use of the sectional docks in America, still, there are conditions, and especially so in the case of a war navy, in which such diversified types of vessel exist, where great longitudinal stiffness becomes necessary. This is a subject to which the author's firm have given the greatest attention, and the type of dock which they have but lately introduced, especially with a view of meeting this difficulty, will, it is believed, entirely overcome the same. Here, again, one can only say that if the naval architect can construct vessels over 700 ft. long that are hurled through the Atlantic gales at railway speed, surely the same men with the same knowledge and the same materials at their disposal can design a structure safe enough to carry such vessels, when it is remembered that it has only to float in the smoothest of waters. That the latest type of dock has ample stiffness is shown by the fact that two of them have already been successfully towed, one across the Atlantic ocean and the other across the North sea, whilst of two more under construction, one will again have to cross the Atlantic and the other to coast round the best part of the eastern shore of North America. Another unfounded belief is that the steel floating dock is short-lived, but here again modern advance has not been reckoned with. There are hardly any floating docks built nowadays that are not entirely self-docking, that is to say, that permit of the easy visitation of all their parts both inside and out. With proper care, therefore, there is no more reason why a steel dock should deteriorate than there is that our roofs and bridges and similar structures should do so. Experience is not yet long enough to know the complete duration of iron structures, but fifty years certainly does not practically deteriorate them, and half a century should be almost long enough to look forward to. Indeed, too much account may very easily be placed on the advantage of a long-lived structure. The world does not stand still, and the requirements of today are not those of the morrow. One cannot help making the pertinent remark that the stone docks of last century, although still in excellent preservation, are not of any very great use nowadays; and it would not be unfair to prophesy the same of our present docks fifty years hence. It is not well for progress that humans should look too far ahead.

ADVANTAGES OF THE FLOATING DOCK SYSTEM.

Coming now to the advantages of the floating system, and beginning with the selection of the site, the floating dock will give a wider range of choice in that not only is the whole of the water space available, but even dry land can be utilized. The excavation required for a floating dock will not exceed in size and depth that required for a masonry dock, with the great advantage in favor of the former that such excavation can be carried out by means of ordinary dredging or grabbing, and requires no cofferdams or pumping to keep the dredged hole free from water for the putting in of the invert. There is also an advantage in the rapidity with which work on a floating dock can be commenced; there is no necessity for careful borings in order to determine the nature of the site before the drawings can be commenced; within a few days of the determination to proceed with the work, the first drawings and quantities can be got out and the steel hull commenced; and whilst this is completing the site can be dredged out; the two operations proceeding simultaneously instead of having to wait one on the other as in the case of the masonry dock. Indeed, the rapidity with which a floating dock can be constructed is very remarkable, and the author will doubtless be allowed to cite the case of the Stettin dock as a proof of this assertion. This dock, of a lifting power of 11,000 tons, had the first plates of the bottom laid on the blocks twenty-three days after the first intimation of such a dock being required was brought to the author's firm. The dock was completed and launched within 7½ months from such date. During this time the hole for its reception had been dredged in the river bank, and within eight months and thirteen days from the first inception of the project, the dock, after having been towed to its site and moored in place, was lowered ready to receive a vessel. Similar rapid construction was effected in the case of the 10,000 ton dock for the Spanish government at Havana, and here, perhaps, greater credit still is due to the builders, who were the same in both cases, namely, Messrs. C. S. Swan & Hunter of Wallsend-on-Tyne, for they were considerably handicapped by not obtaining possession of the yard where the dock was to be built until some time after their contract was signed, but still the dock was delivered at Havana, 6,500 miles distant, within the contract time of eleven months.

In the commencement of this paper it was pointed out that the dimensions of a graving dock had to be larger than those of the ship in every direction. Such dimensions form, therefore, absolute limitations to the usefulness of that dock for that ship. A floating dock is not, however, so limited. Being open at each end it can take ships of any length. It is not a question of the dock, but rather whether the ship is strong enough to support its overhanging portions projecting beyond the same. In a stiff, girder-like structure like a ship the permissible overhang experience has been shown to be very large, and, indeed, in modern ships the tendency of builders is to take advantage of this. In order to obtain maneuvering power it is the practice to considerably cut away the deadwood aft and carry the forefoot a long way back into the keel. In war ships this is most marked and the author has got together in the following table a few typical examples of such cases.

Floating Dry Dock as an Adjunct for a War Navy.

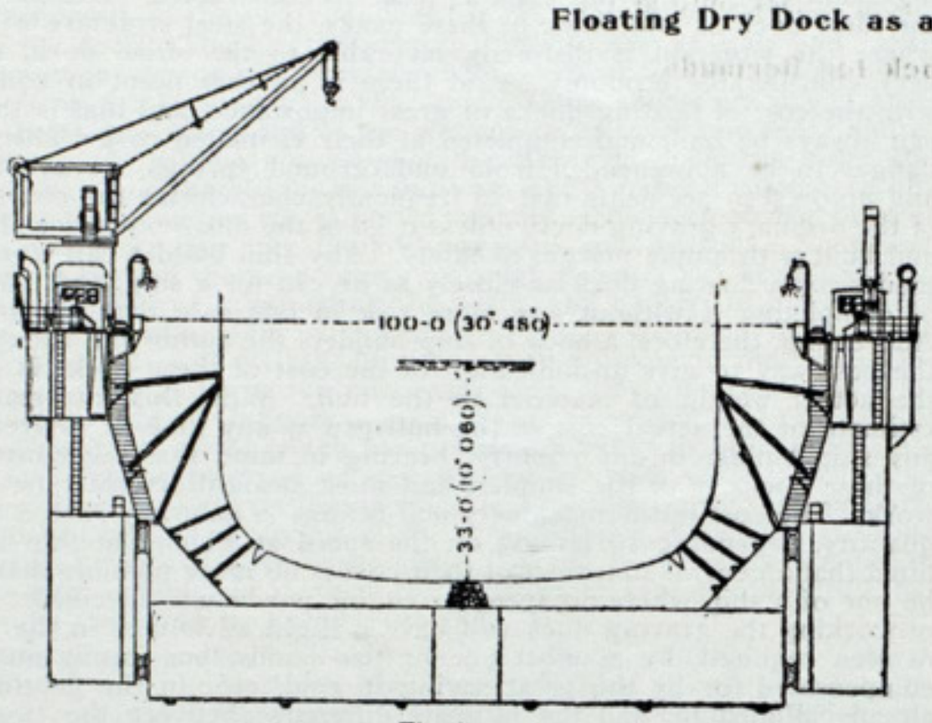


Fig. 2.

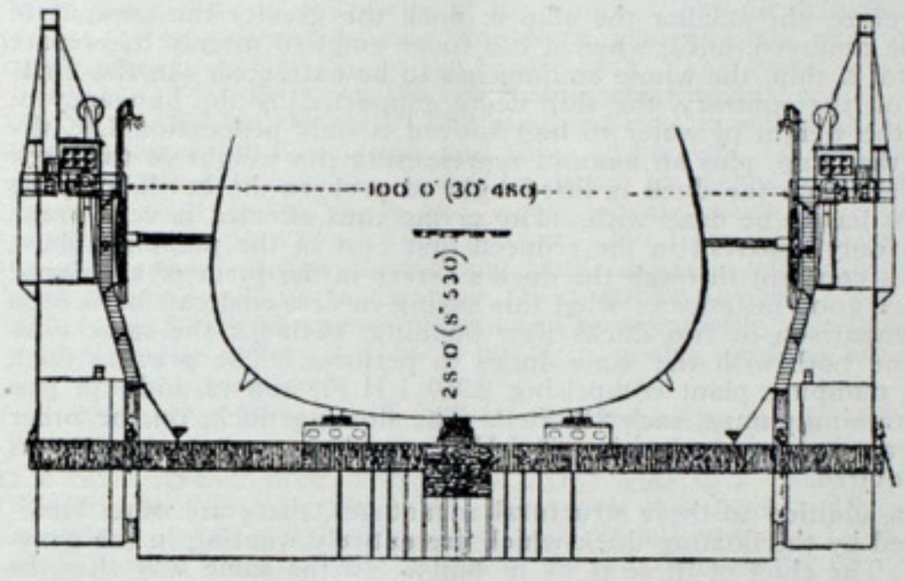


Fig. 3.

Name of Vessel.	Nationality.	Displacement	Length.	Length of straight keel.	Straight keel in terms of length.	Weight per foot run of straight keel.
		English tons.	Ft. in.	Ft. in.		English tons.
Kaiser Karl d. VI	Austria	6,151	367 6	187 6	0.51	32.81
*Campania	Great Britain	19,000	600 0	527 0	0.88	36.0
*Magnificent	"	14,900	390 0	343 0	0.88	43.40
*Oceanic	"	19,260	685 0	559 0	0.82	34.45
*Powerful	"	14,200	500 0	384 0	0.768	37.0
Charlemagne	France	11,097	385 6	310 0	0.80	35.80
Dupleix	"	7,579	426 6	260 0	0.61	29.15
Freya	Germany	5,561	344 5	187 6	0.54	29.66
Kaiser Wilhelm d. Grosse	"	10,827	377 4	193 9	0.52	45.81
A B. (new vessel)	Italy	7,874	400 0	164 0	0.41	48.01
Idzumo	Japan	9,750	400 0	231 3	0.58	42.20
*Shikishima	"	14,850	400 0	310 0	0.77	47.90

Dimensions of vessels marked thus * have been obtained from the owners or builders direct. The lengths of straight keel for other vessels have been computed from diagrams in Brassey's 1900 Annual.

Doubtless in many of the extreme cases shown by some of the war vessels it is intended to support them when docking under the raised portion of the keel as well, and, indeed, the author is aware that such is the intention in some cases; but for the liners no such support would be necessary, and it is interesting to note that a floating dock of a length over keel blocks or lifting portion proper of only 560 ft. would provide all the bearing surface asked for by the builders for the longest vessel at present afloat. Light lattice projections at each end would doubtless be useful beyond this length to provide working platforms, but this is a very small matter, and separate rafts might equally as well be used. These facts form an interesting comparison between the length limitations of graving and floating docks, for whilst the minimum length of the former for such vessels as the Oceanic would be 706 ft., the maximum length of dock proper required in the case of the latter would be only 560 ft. The beam of a floating dock is, of course, limited by the position of the side walls. On the other hand, however, there is but little constructional advantage in keeping the invert of small width; there are no gates to be closed against a heavy water pressure, nor anything else to induce the engineer, unconsciously perhaps, to keep his entrance as small as possible. In the same way there is no need of heavy side walls with a large

amount of batter to compensate for the water pressure on the invert, but the dock can, if desired, be built with vertical walls, and present a square profile right down to the floor. Again, in the question of draught of water over sill, the limitation, which is absolute in the case of a graving dock, is only partial in that of a floating dock, for this, although normally constructed for a given draught, could always be lowered a foot or more deeper, if the dock master saw that by so doing he could accommodate a special and urgent case. The necessity of dealing with vessels at all states of tide, a point already raised, also disappears in the case of a floating dock. No vessel will have to be refused because the tide that day has not come up high enough over the sill. A floating dock can work as well at the top of spring tides as at the bottom of the same. No alteration or modification is required to the dock itself, it being merely a matter of dredging the hole for its reception a little deeper.

LIMITATIONS OF THE FLOATING DOCK.

The floating dock has, however, its limitation, and that is in its lifting capacity. If the ship displaces more than the dock's buoyancy it cannot be lifted. But there again the limitation is only partial. A ship either can or cannot get into a graving dock—there is no half-way house—but the floating dock, although it may not be able to lift a ship completely, can always do something towards it. There is no commoner accident to the ordinary ship than damage to the propeller, and to lift such a ship sufficiently high to get the stern tube out of water requires no very great buoyancy on the part of the dock, and many cases could be instanced where a dock has been able to thus successfully deal with vessels of nearly twice its normal capacity. The mention of the question of the lifting power forms an opportune occasion for pointing out how very much less power is required by a floating dock to lift a given vessel in a given time. When docking a ship in a graving dock, the whole of the contents, less only the volume of the ship, have to be removed by pumping. Therefore, the smaller the ship in dock the greater the amount of water to be removed, until, when it has to be emptied merely to prepare the berth for a ship, the whole amount has to be extracted. In the floating dock, on the contrary, the ship being supported by the buoyancy of the dock, the weight of water to be removed is only proportional to the weight of that ship, plus an amount representing the weight of the dock itself, whilst, when the dock is lifted light to prepare the berth, only its own weight has to be dealt with. The saving thus effected is very great, and is not only apparent in the reduced first cost of the pumping plant, but remains constant through the dock's career in the form of a reduced coal bill. A good instance of what this saving in first cost can be is seen from a comparison of two docks now building, both for the same government and both with the same duties to perform. The graving dock requires a pumping plant comprising 2,940 I.H.P., and in addition two separate draining pumps, each 245 H.P. The floating dock, on the other hand, has an aggregate of only 800 I.H.P., no drainage pump being, of course, required.

But, in addition to these structural advantages, there are other facilities afforded by the floating dock which are entirely wanting in the graving dock. The chief of these is its mobility. In the same way that the dock can be constructed in the home dock yards and towed to its destination, so can it later on in its career be moved from port to port as the exigencies of the moment require. This facility may be of great advantage as the natural tendency is to place all arsenals up some river or creek at a considerable distance from the open sea, where ships may lie out of the fire of the enemies' guns. Such positions have, on the other hand, the disadvantage that, as a rule, the channel leading up to them is long and tortuous, and with no too great depth of water. Take the case of Chatham, for instance; after a sea fight off the mouth of the Thames it would be a most hazardous undertaking to take a crippled and leaking ship with tired-out crew and nearly spent coal supply up through the channel of the Medway. Apart from the difficulty of navigating the ship and the chance of her foundering on the long journey, the still graver eventuality has to be faced that if she did sink she might block the narrow channel, locking up the ships then in that arsenal and effectively cutting it off from any others who might be wanting its aid. Here the capability of the floating dock comes into play. In times of peace it might lie at Chatham or in Portsmouth, or any other protected arsenal, but in times of war it could be moved down to the mouth of the Thames, or into the Solent, ready to pick up any of the lame ducks straggling home. Its work would not so much lie in complete repairs as in merely stopping bad leaks, and generally patching up things and making the hull tight and in a fit state to navigate the home channels. Such a dock might, indeed, be likened to a military field hospital which renders first aid to the wounded, binds up their wounds, and sends them back to the safety of the base hospitals, which, in this case, would be represented by the fully equipped and protected arsenal. But the advantage of mobility can go even further than this. It is impossible for anyone who has read Capt. Mahan's work "On the Influence of Sea Power Upon History" not to be struck by the advantage of the possession by one side or the other of a naval base where they could refit and repair their vessels. The success of the English fleets in the wars round about the beginning of the present century were indubitably largely due to the excellent naval bases they either already possessed or seized during those wars, enabling them to rapidly refit after a fight, and again take the sea. In those days any sheltered port formed a base, for the crew alone could haul down their vessels and repair under-water damage. With modern vessels, however, a more elaborate outfit is necessary, and a dry dock of some sort is a necessity. Here comes in the utility of the floating dock. Escorted by a powerful and specially constructed tug carrying all the necessary repairing tools and a stock of material, once the new base firmly seized, the dock could be rapidly installed there, and in a few hours convert an ordinary natural harbor into a fairly equipped arsenal.

It is tempting to speculate on what might have been the result of the sea fight off Santiago had the one side possessed an arsenal at this port or the other a floating dock that they could have installed close by Guantanamo bay. One has only to make the very likely assumption that by the aid of fog or of a heavy enough sea to nullify the accurate shooting of the blockaders, the invested fleet had managed to slip past the blockading ring and obtain a small start, and their total annihilation or partial escape must have depended almost entirely on the relative condition of the ships' bottoms, in other words on the possession by one or other of the belligerents of a suitable dock. Following this war still further, and assuming that it had been necessary for the states to send a fleet to European waters, can it be denied that the seizure of one of the Spanish islands in Europe and in the installation there of a floating dock, would not have allowed the American battleships to keep the sea for much longer periods and her cruisers to patrol the enemies' seaboard with speed undiminished by foul bottom? The author ventures to prophesy that in the future, now that all nations both in the New and Old World are recognizing the necessity of colonies, thus extending the area of any future war over the whole globe, that the great possibilities of the floating dock in the way of mobility and ready transference from one base to another, will be more fully recognized than they are at present.

COMPARATIVE COSTS OF GRAVING AND FLOATING DOCKS

A paper like the present, which has developed itself into a comparison between graving and floating docks, would be incomplete without some mention of the comparative costs of the same, their working expenses and cost of upkeep. As regards first cost it is, of course, quite impossible to make any real comparison. The prevalence of the required material, the ready and abundant supply of cheap labor, largely affects the cost of a graving dock apart from the enormous influence the nature of the soil would have on the design. In a similar way, a rise in the price of ship materials, such as has been seen in the last two years, renders even actual prices of docks useless without copious explanatory notes. It may, however, be generally stated that the floating dock will always come out cheaper of the two, even when compared with the more or less makeshift type of graving dock as hitherto constructed. Compared with the ideal dock as laid down in these pages, the steel structure will, even where the situation is distinctly favorable to the stone dock, show a very considerable economy. And there is another point in connection with the cost of floating docks of great importance, and that is that they can always be built and completed at their estimated cost. There is no danger to be apprehended from underground springs, no eventualities and unforeseen accidents that so frequently characterize the construction of the ordinary graving dock, unless it be of the most expensive character and built with ample margin of safety. Any ship builder can work out a tender for a floating dock as closely as he can for a ship, and make sure of completing it without any more risk in one case than in the other. Addressing, therefore, a body of ship builders the author has thought that the best way to give an indication of the cost of these docks is to state the actual weight of material in the hull. With this information an estimate of the actual cost of the hull can at any time be arrived at by any ship builder in any country, bearing in mind that the construction of these docks is of the simplest and most straightforward type of tank work. The cost of the machinery and fittings is naturally such a variable quantity, depending so laregly on the speed at which the ship is to be lifted that a general statement of their cost is no more possible than would be one of a ship where no speed or engine power was specified. In cost of working the graving dock will have a slight advantage in the number of men required, by at most one or two hands, but this is more than compensated for by the great saving in coal, etc., in the floating dock already alluded to, and the ultimate difference between the two would be quite negligible. In cost of upkeep the graving dock should theoretically show a great advantage over the steel structure, if it is thoroughly well constructed in the first place. In practice, however, there are always a number of small repairs, and there is the constant running of the drainage pumps to be put against this advantage. In a floating dock the cost of upkeep can in practice be kept very low, if small repairs and general touching up are done by the crew of the dock, and indeed it resolves itself then into merely the cost of paint and material. The amount of overhaul required will again depend very largely on the nature of the water in which the dock is moored, and it may require complete repainting every year or so, or it may go, as in the case with one dock designed by the author's firm, some twelve years without wanting its underwater portion in any way touched. From actual figures relating to the cost of repairs to a floating dock under average conditions of site, which was allowed to go nine years without any attention, it was found that the cost of a complete overhaul of both hull and machinery amounted to about 7 per cent. of the first cost of the dock alone. Assuming therefore that such overhauls were again required at equal periods, it follows that the setting apart of a sum, not so much as 1 per cent. per annum of the first cost of the dock, would suffice to keep it in proper and permanent repair.

PARTICULARS OF MODERN FLOATING DRY DOCKS.

It is not proposed to enter into any description of the particular form of floating dock especially for the use in a modern war navy, but some illustrations are appended which show the general form and give main dimensions. The first of these illustrates the floating dock that the author's firm is at present designing for the British government, and which is to be placed at Bermuda, and the contract for the building of which has been placed in the hands of Messrs. C. S. Swan & Hunter, of Wallsend-on-Tyne. See Fig. 1. The length of this dock is 545 ft. over the keel blocks, its width of entrance 100 ft., and it is capable of normally taking vessels drawing 33 ft. of water over keel blocks 4 ft. high. At this immersion the walls have a free board of 3 ft. 6 in., which in urgent cases might be safely reduced by a foot or more in order to increase the depth of water over the blocks. Its lifting power up to pontoon deck level is 15,500 tons, but by utilizing the pound formed by the bulwark surrounding the pontoon decks, additional lifting power up to 17,500 tons can be gained. The dock is most complete in every respect, being furnished with electric lighting installation, electric cranes of five-ton power running along on top of each wall, and powerful steam vertical capstans that can deal with the largest ironclads. The top decks are covered with teak, with arrangements for catching and storing all rain water, and the bottom is protected by greenheart keelsons to prevent damage to the skin should the dock, in cases of extreme low tide, have to sit on the coral that forms the bottom of its permanent site. The engine power of this dock is sufficient to lift an ironclad displacing 15,000 tons in three and a half hours. It will be built on the Tyne, completed and tested there, and towed to its destination as a complete structure. The hull weight of this dock, by which is meant the quantity of steel plates, bars and shapes, rivets, bolts, etc., and all other material essentially necessary to the dock, but not including machinery, timber, or any other

fittings which may be varied to suit the desires of the owner, amounts to 6,500 tons.

The second dock is one that the author's firm has designed for the navy department of the United States, and which is now fast approaching completion at the Maryland Steel Co.'s works, Sparrow's Point, Md. Its length is 525 ft. over blocks, its entrance 100 ft. broad, and it has a lifting power up to pontoon deck level of 18,000 tons. In this case no provision hase been made for utilizing the pound of the dock, but the same could be added, at an extremely small cost, at any future time, should it be required to increase the lifting power to not above 20,000 tons. In general shape this dock closely resembles the one for the British government and is to be moored in the Mississippi at Algiers, La. The dock itself is attached to strong steel columns, sunk in the foreshore, by means of steel lattice booms articulated in all directions. The dock is, therefore, free to rise and fall with the river, which is subject to very severe freshets, frequently rising some 20 ft. above gulf level, and at the same time can be swung in-shore out of the worst of the current, which here occasionally attains a speed as high as four miles an hour. The booms at the same time form gangways, by which approach may be had to the dock and material conveyed thereon. It may also be noted that this form of attachment to the shore allows all the moorings to be made fast to dolphins driven into the river bank, and leaves the sea side of the dock quite open for maneuvering or anchoring other vessels that may be at the station. This dock will also be completed at the builders' yard and towed to its destination. Its hull weight is 5,850 tons.

The end elevations (Figs. 2 and 3) of these two docks are placed together because they show so well the different methods adopted by the governments of the two countries for the shoring or berthing of the ships of the dock. The English custom and also that of Italy and Japan is to support the armor belt on more or less vertical shores inserted under an angle iron firmly attached to the same. These shores are put in position as the ship is rising and as the water recedes more and more shores are inserted. It will be noticed that the Bermuda dock has large and powerful altars constructed for this purpose. The American custom, on the contrary, is to strengthen the bilges of their ironclads with strong bilge or docking keels, forming, with the keel proper, a level bottom. No shores are required beyond those necessary to roughly center the vessel, and no great care is required in adjusting the berth, and one set of bilge blocks does for all sizes of vessels. If the author's long experience in the study of docking vessels will warrant him giving an opinion on the two methods he would like most strongly to express his very great preference for the American plan. It affords a great saving in weight and quantity of shores, a complete set of which has practically either to be kept in store to suit each type of ironclad or specially cut for such vessels, and, what is more important, it effects great saving in time, not only in the preparation of the berth and centering of the ship, but also in the actual lifting of the same. With the American plan it would be perfectly feasible to dock a vessel completely in the time required to center and adjust her with shores according to English practice.

A combination dock would be peculiarly suitable to a large ship building yard undertaking the construction of vessels of all types. This dock consists of three parts, a central one of a length of 386 ft. and a lifting power of 15,000 tons, especially strengthened for the shoring up of ironclads, and two smaller docks each of 3,000 tons, which can be either attached one at each end of the central portion, thus bringing its length up to 700 ft. over blocks, or 760 ft. over all, and its lifting power to 21,000 tons; or which are capable of acting either separately or together, in the latter case forming a dock of a length of 370 ft. and a lifting power of 6,000 tons suitable for dealing with ordinary merchant vessels. The total hull weights of these docks amount to 8,550 tons which represents about 36.5 tons of steel for each 100 tons of vessel lifted. It may be remarked that this form really gives a double dock, each half of which can be worked quite independently, being therefore much superior to the graving dock divided in its center with an additional gate, where the innermost vessel may be blocked indefinitely by any accident to the outermost one. It is also worthy of note for future requirements, that the dock would provide sufficient bearing surface for a vessel 900 ft. over all, if built on the same lines as the Oceanic.

Many other examples of docks might be shown suitable for certain cases. The steel dock is essentially elastic, and easily adapts itself to the peculiarities of the work it has to do. It is not, however, the wish of the author that the present memoir should develop into a catalogue of docks, but rather to call attention to the great facilities afforded by the floating dock, and more especially those which render it so suitable to the uses of a modern navy. That the author should have faith in the future of the floating dock is only what is to be expected, but he may perhaps put forward, as independent justification of his belief, the fact that, although the present type of dock was only introduced in 1896, his firm have already been commissioned to design five of these structures of an aggregate lifting power of 61,000 tons, two of which are among the largest docks extant, and three of which are for the requirements of various governments. Indeed, the ordinary law of evolution should tend to show that the floating dock is to be the engine of the future. We are now in the full flood of the constructive age of steel. This metal has already replaced the timber of our roofs and the masonry of our bridges, and in the United States it now forms the strength portion of all large modern dwellings. There should surely be no great venture in prophesying that in the near future the same material must replace the more unwieldy and cumbersome masses of masonry that represent at present the ordinary form of naval graving docks.

Mr. H. F. J. Porter of the Bethlehem Steel Co. has been invited to deliver an address on the subject "Evolution of the Engine Shaft" at the convention of the National Railway Master Blacksmith's Association at the Cadillac hotel, Detroit, Sept. 19. Anyone interested in the subject is welcome at the meeting.

The bureau of naval ordnance held a test at the Indian Head proving ground last Saturday of Carnegie plate intended for the side armor on the monitor Arkansas, now building at Newport News, Va. Two shots were fired from a 6-in. gun at velocities of 1,968-foot seconds each. The plate passed the test successfully.

DIAMOND SHOAL LIGHT-SHIP.

Light-ship No. 72, to be anchored on Diamond shoals, off Cape Hatteras, was launched this week at the yard of the Fore River Engine Co., Weymouth, Mass. This vessel is the staunchest and most thoroughly equipped vessel of her class in the world. She must needs be to withstand the tidal race off the cape. Neither light-ship nor light-house has yet weathered the race of this sea.

Twenty years ago the contract was let to a New York firm for the sinking of a huge caisson into the sandy bed of the shore, upon which to carry the proposed structure. The caisson, however, was wrecked and the failure discouraged any further effort. A light-ship was then placed on the shoals, but in the big storm of two years ago she was torn from her moorings and blown out to sea. It became evident that a ship of special design was needed for this terrible station, and the vessel just launched is the product of the best engineering skill that the government had at its command. This light-ship will be steam propelled and electric lighted. She is 112 ft. between perpendiculars, with a molded beam of 28 ft. 6 in., and a depth of 14 ft. 10½ in. measured from the main deck beams to the top of the keel amidships. The vessel has three decks, the main and spar decks running the full length of the ship, while the lower deck is broken by the forward coal bunker and the after bulkhead of the engine room. The hull is divided by watertight steel bulkheads into five compartments, and the quarters and storerooms are so arranged as to meet all requirements of safety and comfort.

The dynamos and engines for the electric light plant will be located on the main deck, and within the engine and boiler casing. The accommodations for the crew are forward on the main deck. There will be two hollow steel masts, through which the wiring for the masthead flashlights is to run. These lights, three in number on each mast, are to be adapted for electricity or for oil lamps. The cluster masthead lights will be 59 ft. above the water line, the measurements being taken from the 12-ft. water line to the focus of the lamps. The electric plant will be driven by two noncondensing, double-cylinder engines, running under a steam pressure of 80 lbs. to the square inch. The vessel will be lighted by eighty 16-candle power 100-volt lamps, which will be placed where necessary throughout the ship. The masthead cluster will consist of six 100-candle power 100-volt lamps and these lights will be controlled by an automatic flashing device. It will be driven by means of a belt from the dynamo shaft and a worm and worm wheel, which serve to give the proper rotary speed to a circuit breaker. The light-ship will be propelled by an inverted, surface condensing, single cylinder engine of 250 I.H.P., with a cylinder 23 in. in diameter, 22-in. stroke, driving a cast iron propeller 7 ft. 3 in. in diameter. Steam will be supplied by two straight, cylindrical, tubular boilers, 9 ft. by 16 ft. 7½ in., with a working pressure of 100 lbs. to the square inch.

When No. 72 is on her station, her mooring tackle will consist of a heavy mushroom anchor, shackled to a chain which will lead through the main hawser hole in the stem of the ship to a steam windlass. In addition to this mooring tackle the vessel will have a 2,000-lb. harbor anchor, a kedge weighing 340 lbs. and 120 fathoms of 1 1-8-in. stud link chain, with a breaking strength of 79,100 lbs. Amidships, on either beam, will be swung two whale boats of about 26 ft. length and 6 ft. beam. The spar deck is protected by a gradually rising steel waist, which starts flush a little forward of abreast the foremast, flaring somewhat at the knightheads until at the stem propeller it has a depth of five feet. In addition to a powerful steam whistle, the light-ship will be provided with a steam siren for use in thick and foggy weather. None of the ship's machinery was installed when she went overboard, but the work of placing it in position will be carried on uninterruptedly, and it is hoped the vessel will be able to take up guard duty on her perilous station before the winter season sets in. During the past week the coast and geodetic survey vessel Blake has been surveying Diamond shoals for an anchorage for the new light-ship.

DEAN OF MAINE SHIP BUILDERS.

Amos L. Allen, the dean of Maine ship builders, celebrated his eighty-ninth birthday at his home at Bath on Saturday last. Mr. Allen was born in Freeport Sept. 8, 1811. He learned the joiners' trade, and when seventeen years old walked to the town of Damariscotta, thirty-five miles away, to secure employment. A few years later he settled at Bath, and in 1843, with Stephen Larrabee, he went into the ship business. Their first product was the ship Sarah Louisa, a craft of 600 tons, which in those days was one of the largest ever built. In 1850 Mr. Allen went to Portsmouth, Va., where he still continued in the ship building business, remaining there about seven years and building seventeen vessels, seven of which were sailing cutters for the United States government. On account of the bitter feeling which was growing stronger day by day between the north and south, business became dull, and Mr. Allen returned to Bath, and in 1861 built the gunboats Katahdin and Josco. The former, a craft of 600 tons, was the first vessel to ascend the Mississippi river to New Orleans. During the process of construction the government ordered several costly changes in the hulls of these two vessels and promised to reimburse Mr. Allen for them, but so far has never done so. For several years past he has had a bill before congress amounting to $10,000, and last spring the senate reported in favor of paying the amount.

The navy department has disapproved the application of Naval Constructor R. P. Hobson for the privilege of returning to this country from Japan by way of Siberia and Europe. He suggested the trip that he might make observations of fortifications and dock yards. The department advised him that he should return at once by the most direct route from Yokohama, reporting at the naval hospital at Brooklyn on arrival here. He will be assigned to duty in the construction department at one of the navy yards when his health will permit it.

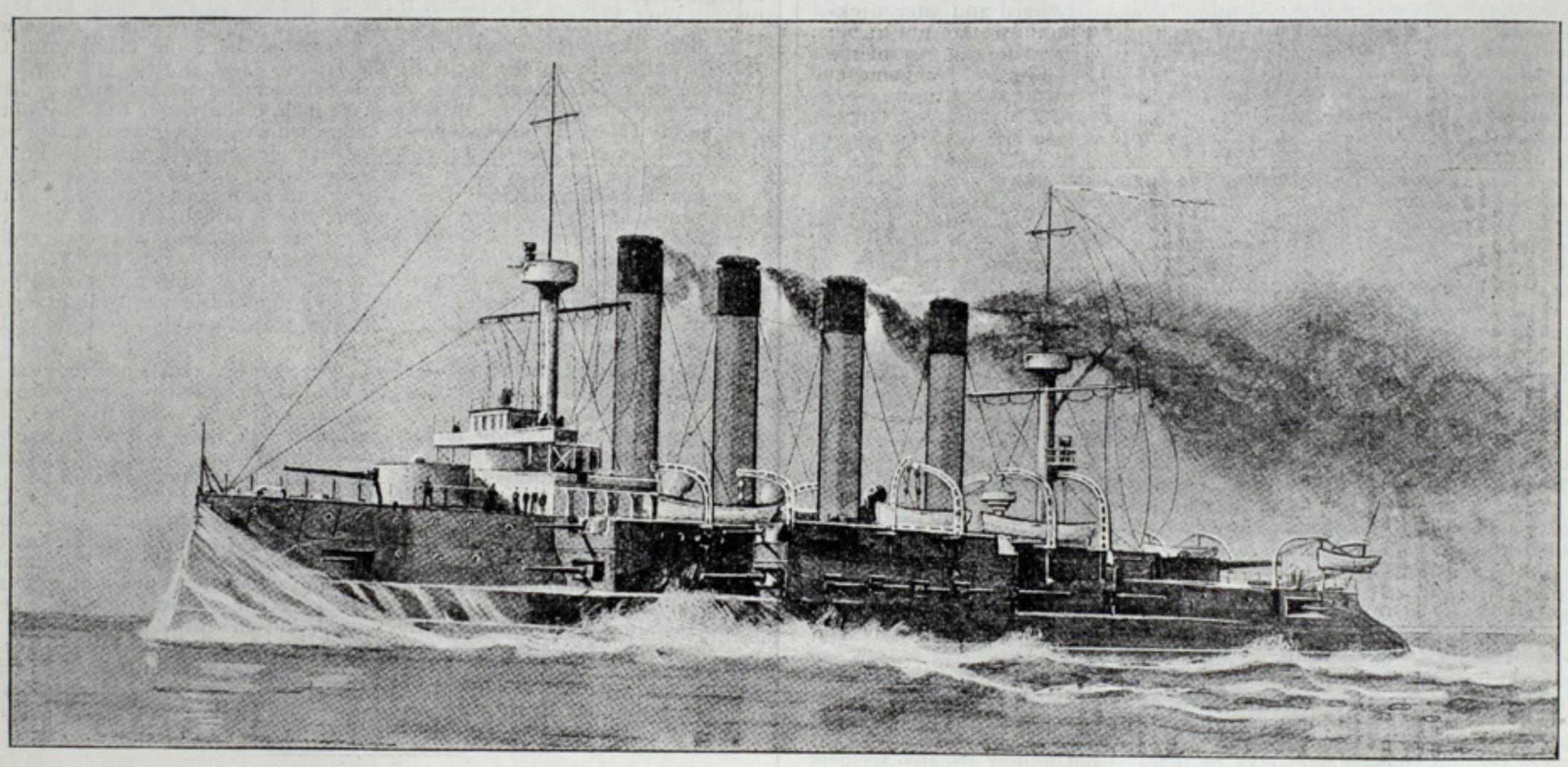
Mr. Gilbert N. McMillan, formerly secretary and treasurer of the Detroit Dry Dock Co. and Dry Dock Engine Works, Detroit, Mich., and who associated himself recently with the Eastern Ship Building Co. of New London, Conn., has been appointed secretary and purchasing agent, located at New London, Conn. This is the ship building company that is engaged in building the big Hill steamers for Pacific trade.

IMPERIAL RUSSIAN CRUISER BAYAN.

The imperial Russian cruiser Bayan, which was recently launched at La Seyne, is in some particulars what she claims to be—a new type of armored cruiser. She is novel in that many of her 12-pounders are behind armor and she is novel also in the class of armor she carries. The general dimensions and features of the Bayan are as follows:

Displacement	7,800 tons
Length	443 ft.
Beam	55 3-4 ft.
Draught (mean)	22 ft.
Guns (all quick-firers)	Two 8 in.
" "	Eight 6 in., 45 calibers
" "	Twenty 3 in. (12-pounders)
" "	Seven 3-pounders
Torpedo tubes	Two submerged
" "	Three above water

The guns are all Russian, from Obuchoff; the torpedo tubes in the case of those submerged will probably be the Elswick patent, which La Seyne has already supplied to some of its ships. The armoring is very extensive, and English influence is particularly noticeable in it. Indeed, but for the amidships redoubt and the absence of double casements the plan might at first sight pass for that of the British Essex class. There is nothing characteristically French about it, though it is fairly well in line with recent French construction and design. The armor is Krupp. The belt, which reaches from the bow to the base of the mainmast, varies from 8 in. to 4 in. in thickness and is not complete as in French design. It is associated with a curved protective deck, a form of protection essentially



IMPERIAL RUSSIAN CRUISER BAYAN.

French. The deck is 2 in. thick on the slope. The belt is about 360 ft. long. Above the water line belt is a belt of thin armor protecting the lower deck. This is 3 in. thick and extends 335 ft. from the extreme bow. It will just keep out shell from 6-in. guns, but not shot. This belt protects the lower deck and two of the three above water torpedo tubes. The third tube in the stern is unprotected. This upper belt covers the lower deck and reaches to the main deck, upon which all the 6-in. guns are carried. On this main deck there are three separate redoubts, all 3 in. in thickness. The forward and after ones both contain a pair of 6-in. guns, one on either side. The central and large redoubt contains four 6-in. guns and also eight 3-in. 12-pounders, carried four each side. This is the novel feature. It is not clear what isolation will be given to these guns in the way of screens; probably bearing in mind the size of the ship, it will not be very much. Above each 6-in. gun 12-pounders are carried behind shields. The remaining four are on the main deck—two well forward and two right aft. On the high forecastle, and aft on the top of the main deck, are the 8-in. guns in closed balanced turrets, 7 in. thick. The hoists of these are 3 in. thick. There is also a 3-in. tube protecting the voice pipes from the conning tower, which is 6½ in. thick and placed up rather high.

All Russian ships carry plenty of search lights. The Bayan has one in the foretop, one carried low on the mainmast, one in the bow under the forecastle, one in the stern and one each side amidships, carried on top of the central battery. There will be four large funnels serving twenty-six Belleville boilers, fitted with economizers and placed in four groups. The stoke holds are eight in number and each contains three boilers, except the aftermost pair, which contain four each. The engines are designed to work up to 17,000 I.H.P., with an estimated speed of 21 knots, which, according to contract, has to be maintained for twelve hours. The coal carried is 750 tons, but there is stowage room for 1,100 tons. This—as with water tube boilers the consumption for all purposes is approximately a ton a knot—gives the ship a full speed radius of 1,300 miles. It will also work out about 3,000 miles at 18 knots. Theoretically, of course, the radius is larger, but theory generally omits an important item of consumption—auxiliary purposes. The Bayan has twin screws. She is a cruiser, pure and simple, built with an eye to cruiser work. The modern cruiser must carry vertical armor if she is to survive a single action. This naval officers have long and always contended, though ship designers have taken some time to realize it. The quick-firer left no alternative and it is probably folly nowadays to lay down any ship, no matter what her size, that is devoid of some sort of armor protection of the vertical sort. Just as no one now dreams of building cruisers without protective decks, so, by-and-by, no one will dream of building them unarmored, no matter what their class. This is the general trend of naval opinion in all nations; and there will probably be no mean between the vertically-armored ship and the unarmored destroyer.

MORE ORDERS FOR LAKE SHIPS.

Although the different yards of the American Ship Building Co. on the great lakes were practically filled up with new work for the coming winter when orders were taken two weeks ago for nineteen steel freighters, negotiations are still under way for more contracts and it is quite probable that room will be made to build at least two large steamers for one of the leading steel concerns. Arrangements for such an order are, in fact, practically completed. The vessels can be finished about in time for the opening of navigation next spring by giving to the West Bay City yard more new work than the two 4,000-ton steamers now scheduled for that place. Of course there is no truth in the newspaper reports from Pittsburg about Carnegie interests building ten steamers for through trade from the lakes to the Atlantic seaboard. Some of the statements in the Pittsburg dispatches were so absurd as to be unworthy of serious attention, but, as intimated above, an order for a couple more vessels for the Carnegie lake fleet would not be at all surprising.

A Duluth dispatch announces that the Craig Ship Building Co. of Toledo will build, in addition to the freight steamer of Canadian canal dimensions which they have under way for Messrs. Hawgood and others of Cleveland, a passenger vessel for the Booth Packing Co. to operate along the north shore of Lake Superior out of Duluth. The new steamer will be of steel, 181 ft. long, and will cost about $100,000. The Craig company has made a reputation for itself in the building of the fast passenger steamer Chippewa of the Arnold line, which plies between Mackinaw and the Sault. She is a little gem. The Hawgood steamer Tampico, which is of Welland canal dimensions and which was also turned out last spring by the Craig company, is also a very fine vessel. With pilot house amidship and with all the appearance of a trim salt water freighter, this vessel has attracted a great deal of attention. She will very probably go to New York in November to engage in Atlantic coast trade during the winter. Her owners are now in New York making arrangements with that end in view. Both Capt. Jensen and his mate have been in salt water service, and are prepared to handle the Tampico on the coast as well as on the lakes. She is in every way prepared for salt water trade.

The Detroit Ship Building Co. is already filling up with engine and boiler work that was expected to supplement the new vessels which they are to build during the winter. An order has just been received for a triple expansion engine of 1,000 H. P., to go into a ship building on Puget sound. Besides this, it is constructing two triple expansion engines for the new Lehigh steamer Wilkesbarre. Six boilers for that boat are also on the list, three of which are about completed, and the others nearly so. Then there are six more boilers for the three steamers just contracted for, and an order for two boilers was received recently to go into the wooden steamer Roumania.

Messrs. Kirkwood & McKinnon, Owen Sound, Ont., owners of the City of Windsor, are building a new boat, to be known as the City of Owen Sound, for service between Owen Sound and the Sault. The new boat is a side-wheeler and is expected to make 16 knots an hour. She will have accommodations for 110 passengers with berths and staterooms.

Peckham & Dew of Canastota, N. Y., are making an addition to their factory to be used as a machine shop for the manufacture of marine gasoline engines.

LAUNCH OF TROOPSHIP HARDINGE.

The United States government has had considerable experience of late in converting liners into troopships; so far, however, it has not built any troopships. In the evolution of the liner into the transport the United States government has employed innovations which have caused much admiration abroad. The American transport is a model of convenience and comfort. The general method of fitting out a transport has been hitherto described in the Review (Naval edition, Sept. 28, 1899). The Fairfield Shipbuilding & Engineering Co., Govan, have just launched the troopship Hardinge for the English government and considerable interest attaches to the vessel, since she is the second of her class ever built on the Clyde. The previous vessel was launched as long ago as 1867 by R. Napier & Sons, Govan. The Hardinge is said to be by far the greatest and best contribution ever made to the Royal Indian marine.

The dimensions of the Hardinge, which has a gross tonnage of about 5,600 tons, and a speed of 18 knots, are:—Length over all, 423 ft. 6 in.; between perpendiculars, 407 ft.; breadth, extreme, 51 ft.; depth, to main deck, 31 ft. The vessel is built of steel throughout, and is of the spar deck type, having a cellular bottom all fore and aft, with a very close subdivision by water-tight doors, so that the spaces may be used for the storage of fresh water. The hull is divided by water-tight bulkheads, strengthened in accordance with the recommendations of the parliamentary bulkhead commission, while the general arrangements are in all respects in strict compliance with the admiralty transport regulations. There are four complete laid decks—the orlop, troop, main, and spar decks—and the latter being flush, with no erections other than the necessary castings and houses giving entrance to the accommodation below, is specially suited for exercising the troops in large companies. There are two navigating bridges, fitted on the top of the forward and after deckhouses, similar to those in the latest warships built for the admiralty; and a light gangway connecting these bridges is fitted for the use of the ship's officers when the spar deck is crowded with troops. Arrangements are made for carrying on the spar deck an armament consisting of six 4.7-in. quick-firing guns, six 3-pounder quick-firing guns, and four machine guns, while magazines are fitted below the water-line both forward and aft, for the different ammunition, as in one of her Majesty's ships. All the timber for decks, ceiling, lining, and fittings throughout the cabins and store-rooms is East India teak, no soft wood being used in any part of the vessel.

Accommodation for the military officers is arranged on the main deck aft, with a dining saloon capable of seating eighty persons, and the state room, lavatory, and all other accommodation is fitted up, furnished and upholstered in a high-class manner. The cabins for warrant officers are arranged amidships. The dispensary and hospital arrangements are most complete in all respects, as in the most recently-equipped hospital ships. The troops will sleep in hammocks. Altogether the vessel, when completed, will carry about 1550 persons, of which number about 1400 will be troops and military officers.

In view of the climate in which the vessel will be employed, special attention has been given to ventilation, and a complete system has been arranged for all compartments; electric fans are fitted to the ventilating trunks between decks; bees' wing fans are fitted in the ceilings of the saloon, &c., and these having long blades revolving at a low rate of speed will create a cool current of air, and serve in lieu of punkahs. The side ports are adapted to allow of the greatest possible amount of fresh air being admitted in fine weather by natural means. In order to provide fresh provisions for the voyage a large refrigerating plant has been supplied, with cold storage chambers for meat, vegetables and other provisions, and also for making ice, cooling drinking water, &c. The distilling machinery, apart from the large quantity of fresh water which can be carried in the tanks, is capable of supplying about five gallons of fresh water to each person on board every twenty-four hours. The draining and pumping arrangements and fire service are all of the most perfect description. The installation of electric light is fitted in the same manner as in admiralty ships, all lamps, fittings and wiring being of naval service patterns. In addition to a large number of incandescent lamps there are yardarm lights and signal lights. A search-light projector of admiralty pattern is fitted on the bridge, with traversing rails, etc., complete. The generating plant is in duplicate, each set of engines and dynamos being capable of supplying the full installation, and the engines are arranged to work with steam either from the donkey or main boilers. Electric bells and voice pipes of the latest admiralty pattern are fitted throughout the saloons and from the bridge to wheel-house, engine-rooms, and wherever else required.

To obviate the noise and vibration usually caused by working cargo by ordinary steam winches, as well as the heat of steam pipes passing through the compartments below, hydraulic derricks are fitted to the masts for working the cargo. These are capable of taking lifts up to six tons. With this hydraulic gear the space usually occupied by steam winches on the deck is saved, and the deck left more clear for the benefit of the troops. A hydraulic boat-hoisting winch is fitted amidships, and a hydraulic warping winch aft. The steam capstan windlass forward is of special design, adapted for lifting or holding three cables. Steam and hand steering gears are provided, the former being operated from the wheel house and the bridge, on which the usual telegraphs are fitted. The outfit of boats comprise a 32-ft. steam launch, six 33-ft. steel lifeboats, six wood boats, eight 28-ft. Berthon boats, the latter being placed under davits arranged specially to work them, as well as the steel and wood boats.

The propelling machinery of the Hardinge consists of two sets of triple-expansion surface-condensing engines fitted in two water-tight compartments, each set having three inverted cylinders working on three cranks. The high-pressure cylinders are each 29 in. diameter, the intermediate 46 in., and the low 72 in., the stroke of piston being 4 ft. The high and intermediate cylinders are fitted with piston valves, and the low-pressure with a double-ported slide valve. The valves will be worked by the usual double-eccentric and link-motion valve gear. Each set of valve gear will be controlled by a combined steam and hydraulic reversing engine. The crank shaft is built in three pieces, each piece being interchangeable, and, together with the thrust, tunnel, and propeller shafts, is of forged mild steel. Each screw propeller has three blades of bronze, the boss being of cast steel. The condensing water will be supplied to the condensers by two large centrifugal pumps, one for each condenser, each worked by an independent engine, and each capable of supplying the circulating water required by both main engines in the event of one pump being disabled. Both circulating pumps will be connected to large valves leading to the bilges, so that in the event of a serious leak in the ship these pumps could be utilized for pumping out the engine-room. The engine-rooms will be fitted with all modern appliances, including two sets of distilling machinery for making fresh water to supply the boilers and for drinking purposes, two large feed filters, and two feed heaters; also, all other necessary fittings to ensure economy of working. The engine and boiler rooms will be fitted with ten motor fans for ventilating purposes. A complete installation of donkey pumps necessary for the special nature of the service will also be fitted.

The boilers for generating the steam for the engines are of steel, five in number, of the ordinary multitubular marine type and arranged to work with Howden's forced draft. Each of the double-ended boilers has six furnaces, and the single-ended three, making a total of twenty-seven furnaces, the product of combustion being led into two funnels. There will be an auxiliary boiler for supplying steam to the donkey pumps, fresh water condenser, galleys, and for general purposes when in port. The vessel, when finished, will be equipped in the most perfect manner for the health and comfort of troops, and with her two masts and two funnels will have a very smart appearance. All the work has been done under the supervision of Sir E. J. Reed, K. C. B., naval architect and engineer to the India-office, with Mr. F. F. Hill as resident overseer.

OUR SHIPPING INTERESTS—NICARAGUA CANAL.

From President McKinley's letter of acceptance.

Ninety-one per cent. of our exports and imports are now carried by foreign ships. For ocean transportation we pay annually to foreign ship owners over $165,000,000. We ought to own the ships for our carrying trade with the world and we ought to build them in American ship yards and man them with American sailors. Our own citizens should receive the transportation charges now paid to foreigners. I have called the attention of congress to this subject in my several annual messages. In that of Dec. 6, 1897, I said:

"Most desirable from every standpoint of national interest and patriotism is the effort to extend our foreign commerce. To this end our merchant marine should be improved and enlarged. We should do our full share of the carrying trade of the world. We do not do it now. We should be the laggard no longer."

In my message of Dec. 5, 1899, I said: "Our national development will be one-sided and unsatisfactory so long as the remarkable growth of our inland industries remains unaccompanied by progress on the seas. There is no lack of constitutional authority for legislation, which shall give to the country maritime strength commensurate with its industrial achievements and with its rank among the nations of the earth. The past year has recorded exceptional activity in our ship yards, and the promises of continual prosperity in ship building are abundant. Advanced legislation for the protection of our seamen has been enacted. Our coast trade, under regulations wisely framed at the beginning of the government and since, shows results for the past fiscal year unequaled in our records, or those of any other power. We shall fail to realize our opportunities, however, if we complacently regard only matters at home and blind ourselves to the necessity of securing our share in the valuable carrying trade of the world."

A subject of immediate importance to our country is the completion of a great waterway of commerce between the Atlantic and Pacific. The construction of a maritime canal is now more than ever indispensable to that intimate and ready communication between our eastern and western seaports demanded by the annexation of the Hawaiian islands and the expansion of our influence and trade in the Pacific. Our national policy more imperatively than ever calls for its completion and control by this government; and it is believed that the next session of congress, after receiving the full report of the commission appointed under the act approved March 3, 1899, will make provisions for the sure accomplishment of this great work.

OFFICIALLY NUMBERED DURING AUGUST.

The bureau of navigation reports 101 vessels of 31,564 gross tons were built in the United States and officially numbered during August, 1900, as follows:

	WOOD.				STEEL.		TOTAL.	
	SAIL.		STEAM.		STEAM.			
	No.	Gross.	No.	Gross.	No.	Gross.	No	Gross.
Atlantic and Gulf..	42	11,283	16	792	2	661	60	12,736
Pacific.....	5	2,891	4	,075	1	16	10	4,982
Great Lakes.....	1	17	5	151	3	11,608	9	11,776
Western Rivers.....	4	91	18	1,979	.....	.....	22	2,070
Total.....	52	14,282	43	4,997	6	12,285	101	31,564

The foregoing figures do not include craft without motive power of their own. The steamer Argyll of 2,953 tons was added to the merchant fleet by act of congress.

An interesting trial took place recently in the Mediterranean, when four ships of the British squadron were ordered to steam under four-fifths power from a point six miles east of Gibraltar to another point six miles north of Cape Figan, Spain. The distance was 788 miles, which the new battleship Ocean covered in 46 hours and 54 minutes, an average of 16.8 knots, consuming 520 tons of coal. The battleship Renown, four years old, averaged 16 knots, and the Isis and Dido, cruisers of 5,600 tons, 16.7 and 16.25 knots respectively.

Admiral Bradford, chief of the bureau of equipment, has rejected the bids recently opened for the coaling station to be established at Frenchman's Bay, Me., and has invited new proposals, to be opened some four weeks hence.

MARINE REVIEW

Devoted to the Merchant Marine, the Navy, Ship Building, and Kindred Interests.

Published every Thursday at No. 418-19 Perry-Payne building, Cleveland, Ohio, by THE MARINE REVIEW PUBLISHING CO.

SUBSCRIPTION—$3.00 per year in advance; foreign, including postage, $4.50, or 19 shillings. Single copies 10 cents each. Convenient binders sent, post paid, $1.00. Advertising rates on application.

Entered at Cleveland Post Office as Second-class Mail Matter.

It is much the fashion of late to poke fun at the German emperor and to make light of him; but for all his running ear and his withered arm, he is a factor to be reckoned with. To us, with his strenuous activity surmounting the severest of physical limitation, he seems one of the greatest of men; and in no way does he come more formidably to the front than in the development of German ship building; for the tremendous strides which this form of industry has made during the past ten years is due to the practical encouragement of the emperor himself. So marvelous has been the development of it, and so prominent has Germany already become among the constructive nations that one forgets its comparative infancy. Formerly practically all of Germany's large steamships were built in the United Kingdom. For instance, the Hamburg-American line, which first began to trade with sailing ships in the year 1847, had their first steamers, Borussia and Hammonia, built and engined by Messrs. Caird & Co., Greenock, in the years 1855 and 1856, and for many years thereafter their fleet received additions from the Clyde. It is only about ten years since the Furst Bismarck was built by the Vulcan Ship Building Co. at Stettin. Similarly the North German Lloyd Co., founded in the year 1856, had all its vessels built in the United Kingdom until 1890, when it gave an order to the Vulcan Ship Building Co. for the Spree. Assuredly the Vulcan company has bettered the instruction which it had received from the Clyde. The Kaiser Wilhelm der Grosse and the Deutschland are its handiwork. The Kaiser's record is that of steaming 2,840 knots in an eastward run of 5 days, 4 hours and 21 minutes, making an average speed of 22.51 knots.

The Deutschland has just finished the most phenomenal passage in the ocean's history, reaching Plymouth from New York in 5 days, 7 hours and 38 minutes at an average speed of 23.36 knots. Germany, moreover, besides holding the Atlantic record, has made greater progress relatively as a ship-owning country, than Great Britain during the past ten years. In 1891 the total tonnage owned in Germany was 1,703,754 tons, and at the close of the year 1899 it was 2,650,033 tons, an increase of 946,279 tons, or considerably over 50 per cent., while in the United Kingdom the increase was from 11,157,662 tons to 13,241,416 tons, or less than 20 per cent. When, however, the steam tonnage is taken into account the progress that Germany has made is still further emphasized. In the year 1891 the steam tonnage owned in Germany was 1,081,830 tons, and in the year 1899 it had practically doubled, being 2,159,919 tons, while in the United Kingdom the increase was from 8,601,679 tons to 11,513,759 tons. Recently Germany has actually surpassed the United Kingdom in the building of vessels of the largest type, having completed during last year nine steam ships each exceeding 10,000 tons, while in the same year only five vessels of similar tonnage were built in the United Kingdom.

A physician quickly entering a room, immediately after a colleague had departed, the dying patient murmured "One woe doth tread upon another's heels, so fast they follow." To paraphrase one may say the same thing of the ocean records nowadays, so fast they follow. The ink is hardly dry upon a record before a new one has to be chronicled. It is quite clear that other records are to follow—the best is not out of the Deutschland yet. It is three years since the Kaiser Wilhelm der Grosse wrested the championship from the Cunard liner Lucania, and until the advent of the Deutschland her time was the fastest of any steamship crossing the Atlantic. There is at present no vessel on the stocks for British account which is intended to recover the lost vantage. Nor is there an immediate prospect of such a vessel. From the British standpoint the question is merely one of dollars. It is being viewed in a coldly commercial light. What is the advantage in an added knot or two? The vessels of the British lines at present are run in such a way that they leave the British port at the most convenient hour for business men. They arrive at New York at an equally suitable and opportune time. Therefore, a knot or two added to the vessels would be of no actual advantage. To arrive in port at an hour when it is inconvenient to go ashore is no gain whatever. The passenger would rather lie abed and go ashore decently after breakfast. There can be no further advantage in clipping the record until it can be clipped twenty-four hours. To add a knot or two to the speed is merely to eat up coal and to make the margin between profit and loss disappear wholly. Take the case of the Oceanic, which was built more for comfort than for speed. Her present speed is 20.72 knots and at that rate she consumes 445 tons of coal per day or 2,800 tons for the voyage. Were her speed increased to 25 knots she would consume 750 tons per day or 3,800 tons for the trip. Moreover, the weight of her machinery would have to be increased from 6,000 to 10,000 tons. What is to compensate for this enormous increase in weight and coal consumption? The 25-knot Oceanic would carry less cargo and consume more coal than the 20-knot Oceanic. The five-day boat is not a measurable possibility with the present form of propulsion. The commercial spirit of the age, which is essentially economic, is against it.

Last Monday was the anniversary of Perry's victory and there were none so poor to do him reverence. Not a salute was fired and not a tap was heard. There is in the capitol at Washington an original painting of the battle of Lake Erie and the itinerant public, assisted by a loquacious guide, does more honor to Perry in a day than is done in a year on the shores of Lake Erie. It is reported that the Niagara, Commodore Perry's flagship, lies at the bottom of the lake near the harbor of Erie, and that on unusually clear days the hull is still discernible. The fleet assembled at Erie prior to the battle and returned to Erie after. Both the Niagara and the Lawrence sought the bottom speedily thereafter. The Lawrence was raised in 1876, and every bit of wood of the old sea fighter was converted into canes which were sold at the Philadelphia exposition. During the recent tour of the lakes by the committee on rivers and harbors, Representative Davenport of Erie related the circumstance of the Niagara, and it was then suggested that the federal authorities raise the hull and preserve it as a relic of that war which kept Ohio out of Canada.

The Marconi system of wireless telegraphy is definitely adopted for the British navy and twenty-five sets have been purchased. Marconi gets a royalty of £100 on each. There is no question among naval men that Marconi's is not merely the best system, but the only one of value. When Marconi was in this country Rear Admiral Bradford, chief of the bureau of equipment, was unable to arrive at a satisfactory figure with the inventor and consequently all negotiations were abandoned.

ANOTHER OCEAN RECORD MADE.

The race between the Deutschland of the Hamburg-American line and the Kaiser Wilhelm der Grosse of the North German Lloyd line has resulted as expected. The Deutschland is easily the winner and has made the fastest trip ever made across the ocean. The time of the Deutschland's passage from New York was 5 days, 7 hours and 38 minutes. Her average speed was 23.36 knots. The Kaiser had one hour's start of the Deutschland. The officers of the Deutschland say that they sighted the Kaiser at 5:30 o'clock on the morning after leaving Sandy Hook. She steadily gained on the Kaiser and overhauled her early in the afternoon. The Deutschland left her hull down on the horizon at 5:07 o'clock of the same day. The log of the Deutschland shows that her daily runs were 507, 535, 540, 549, 545 and 306 knots. The Kaiser's log shows that her daily runs were 408, 514, 519, 520, 520 and 505 knots. Her average speed was 22.40 knots, which fails to equal her best record of 22.79 knots. The Deutschland covered the shortest course ever sailed by a liner between New York and an English channel port, logging only 2,982 knots and beating her previous record to the eastward, when she reeled off 3,072 knots, by 4 hours and 7 minutes. She was built to develop about 35,000 H.P., but she exceeded that on this trip by 1,913 H.P.

In an interview in Liverpool Mr. Moorhouse, manager of the Cunard line, discussed the performances of the Deutschland. The Cunard company, he said, was watching the new steamer with the greatest interest. It was fully awake to the situation, but was content for the present to look on. He would not say what the Cunard company might decide to do in the future. It did not lose sight of the fact that every increase in speed beyond a certain limit increased the expense in almost geometrical ratio, and that there was a point at which the game ceased to be worth the candle. Finality in the development of the Atlantic liner was admittedly not yet reached, though the production of higher speed must necessarily be experimental.

TORPEDO BOAT DESTROYERS LAWRENCE AND MACDONOUGH.

The United States torpedo boat destroyers Lawrence and Macdonough are now nearing completion at the yard of the Fore River Engine Co., Weymouth, Mass. A trial of the Lawrence will probably be held within a few weeks. These boats are 246 ft. long over all, 23 ft. 3 in. beam, 8 ft. 6 in. draught and of 400 tons displacement. Their armament will consist of two torpedo tubes, two 12-pounder and five 6-pounder rapid-fire guns. The engines are twin screw, vertical, four cylinder, triple expansion, with cylinders of 22, 31, 34 and 34 in., the stroke being 20 in. The total cooling surface of the two condensers is 7,000 sq. ft. The propellers are three-bladed Manganese bronze, 6 ft. 6 in. diameter, and the shafting is of nickel steel 7¾ in. outside diameter, with 3¾ in. axial hole. Each vessel is fitted with four water tube boilers, having a total grate surface of 320 sq. ft. and a total heating surface of 18,000 sq. ft. The working pressure is 260 lbs. The I.H.P. is stated as 8,000 and the revolutions 360 per minute. These boats are expected to attain a speed of 30 knots an hour. They were designed by the builders and in some respects resemble Herreschoff productions.

The Ventura, last of the three steamers building at the yard of the William Cramp & Sons Co., Philadelphia, for the Oceanic Steamship Co., will be launched in a few days. These vessels are intended to run between San Francisco and Australian ports. They are 400 ft. long, 50 ft. beam, 24 ft. draught and of 9,500 tons displacement. The I.H.P. is 7,500 and the speed 17 knots. Each ship has accommodations for about 400 passengers. The names of the three vessels are Sierra, Sonoma and Ventura.

The summer meeting of the Canadian Society of Civil Engineers occurs in Ottawa from Thursday until Saturday of the present week.

CONNERS' MONTREAL PROJECT.

It has been said several times during the past few months that W. J. Conners of Buffalo failed completely with his big undertaking for the construction of grain elevators, warehouses, etc., at Montreal; that the harbor rights which he sought in the beginning were of great value, but that what he finally accepted, under guarantees of large business to the city, was not at all what he started out to secure. In other words, it was said that on account of the opposition which he met from his home city of Buffalo, and his determination not to be beaten from that source, Conners accepted conditions in his contract with Montreal which he did not expect to have forced upon him, and which weakened the contract as a document intended for the purpose of securing funds to go ahead with the Montreal improvements. However this may be, it would seem that he has not given up the task, as indicated by the following extract from a Montreal paper of a day or two ago:

"On his arrival here Mr. Conners lost no time in putting himself in communication with the harbor authorities. To all with whom he came in contact he still spoke with the utmost confidence of being able to carry the harbor works to a successful issue upon the lines agreed upon. 'I am here,' he said, 'to tell the members of the harbor board that I intend to carry out the agreement as it stands, to build the working-house and the freight and storage warehouses exactly as they are set forth in the plans and specifications. There have been unforeseen difficulties in the way, obstacles that I had not contemplated and could not have contemplated, and these have been the causes of the delay, but now they have been pretty nearly all overcome."

"What about the capital?"

"I have men behind me who are willing to put up all the money that is required to carry out the scheme. As soon as the company is organized we will go ahead. The company is not yet actually organized. That is partly what I am here for, to see my lawyers about the organization of the company. Then I intend to go ahead and see the thing right through."

"Do you think you will have the work actually in progress this autumn?"

"I think so. I have strong hopes that the foundation will be laid this fall, and think we shall go on with the building during the whole of the winter months. The delay has been unfortunate. Nobody has been more keenly disappointed than I have been myself. Nobody will be better pleased than myself to see the work in progress. You will see how we'll make things hum when we begin. Had it remained with me we would have been further advanced than we are. I can hurry myself, but I cannot hurry the others. At all events here I am and here I mean to carry the project through as rapidly as possible."

PASSING SIGNALS -CANADIAN SAULT CANAL.

It is more than probable that the Lake Carriers' Association at its next annual meeting will give attention to the complaint regarding negligence on the part of vessel masters in the matter of blowing passing signals. Several vessel owners who have made trips on their own ships during the present season enter complaint on this score. Some of them say that it is undoubtedly the kind of inattention to duty that eventually results in accidents. Capt. W. C. Richardson of Cleveland is the latest to call attention to the matter. Knowing that the captains are not themselves disposed to enter complaint with officials of the steamboat inspection service, he says that the vessel owners should take up a few cases of violation of the rules and present the necessary evidence to the government.

Another matter to which the attention of owners is also directed is the disposition of vessel masters trading to Lake Superior to pass up and down almost exclusively by way of the United States canal at the Sault. The Canadian canal has had such a small percentage of the business this year that there is some fear of the Dominion government closing it to navigation. The expense of maintaining a force of men at the Canadian lock is, of course, an important item. If the Dominion officials, knowing that their own vessels, so few in number compared with the United States craft, could be easily taken care of in the American locks, should conclude to close their canal and thus save themselves this expense, the results might well be feared by our large shipping interests. In event of accident on the American side, a closed lock on the Canadian side would not be a happy thought to contemplate. Then, too, it is very unfortunate that more use is not made by American vessels of the magnificent canal and lock on the Canadian side of the river in view of the great expense undertaken by Canada in providing this waterway. It will certainly be badly needed before the contemplated enlargement of the old lock on the American side is a reality. One reason why the vessel masters do not go by way of the Canadian canal is the fact that letters and telegrams are usually forwarded in care of the American canal office. This could be changed, of course, as far as the correspondence of the ship with her owners is concerned, but it is claimed also that the upper approach to the Canadian canal is a narrow channel and that there is not the certainty of deep water in it that there is in that part of the river leading to the upper ends of the American locks.

NAVAL ARCHITECTURE AT THE UNIVERSITY OF MICHIGAN.

Professor Herbert C. Sadler, B. S., late of Glasgow university, Scotland, has reported for duty at the University of Michigan and will begin work in the new course in naval architecture and marine engineering at the opening of college, Sept. 25. Prof. Sadler is well known to the naval architects of this country, many of whom have been his associates or under him as students at Glasgow. He is a man of charming personality and unquestionably will find a warm welcome from students and colleagues in his new field of labor. Prof. Sadler received his training in one of the principal ship yards of the Clyde and at Glasgow university, of which institution he is a graduate. For the last four years he has been assistant to Prof. Biles, who is well known in America, and has been associated with him in his practice as a consulting naval architect. He has had a large and varied experience in all branches of naval architecture on its practical side, and this, together with his experience as assistant professor at Glasgow university, renders him eminently suitable for the position he now holds.

The course of instruction in naval architecture at Ann Arbor, which is arranged as a graduate course, will commence at the second semester of the senior year and extend to the end of the fifth year. At the end of the senior year students may receive the degree of bachelor of science in engineering and at the end of the fifth year that of master of science. For this year only a special course has been arranged, which will extend from the commencement of the coming semester to the end of June. In the future the course will be that already prescribed, namely, will extend over one and one-half years. The work will consist of lectures, drawing and visits to ship yards, and will in general follow the course given at Glasgow. Lectures will be given upon ship calculations, strength of ships, resistance and propulsion, stability and rolling, ship design, practical ship building and marine engine and boiler design. In the drawing class each student will perform all the calculations connected with a vessel and will also prepare one or more designs, including complete plans and specifications.

BUFFALO HARBOR REGULATIONS.

Major T. W. Symons, United States engineer, has just issued, with the approval of the secretary of war, the new regulations governing the navigation and use of the entrance channel at Buffalo. These regulations go into effect at once and are as follows:

In the entrance channel of Buffalo river, or harbor, N. Y., between the United States breakwater light station and the junction of Buffalo river with the city ship-canal, the speed of all vessels shall be limited to and not exceed 6 miles per hour.

While dredging operations or repairs of the United States piers along this entrance channel are going on, all vessels shall slow down to a speed of 4 miles per hour, while passing said dredges or pier where repair operations are in progress, upon being requested to do so by the display or waving of a red flag or red lantern, or the blowing of a succession of short whistles.

Dredges and attending scows and tugs are expected and required to give half the channel for passing vessels, and the latter are required to do the same when passing the dredges or other craft.

For the information of masters and pilots, the following data in regard to distances between points, and the minimum time required for passing between these points, are given:

From the breakwater light station to the junction of the Buffalo river and the city ship-canal the distance is 4,200 feet, and the time required is 8 minutes.

From the Buffalo breakwater light station to the outer end of the south pier the distance is 2,100 feet, and the time required is 4 minutes.

From the outer end of the south pier to the junction of the Buffalo river and city ship-canal the distance is 2,100 feet, and the time required is 4 minutes.

Attention is also invited to the regulations regarding anchoring and mooring vessels in the entrance channel to Buffalo harbor, which provide that no vessel of any kind shall anchor in the entrance channel to Buffalo harbor between the north and south United States piers, or be moored to or lie at the United Staes south pier, or be moored to or lie at the United States north pier abreast of another vessel at said United States north pier. This regulation does not apply to government vessels, or vessels of any character engaged in the work of improving the harbor or entrance channel.

AROUND THE GREAT LAKES.

George W. Wallace, whose resignation as superintendent of the Fayal mine went into effect Sept. 1, has accepted a position as general manager of the Corrigan, McKinney & Co. interests in the Lake Superior district.

The Minnesota line steamer Maricopa and the schooners Manila and Marsala, which were towed by that steamer, delivered 22,635 net tons of iron ore at the works of the Illinois Steel Co. at South Chicago a few days ago.

The whaleback steamer Christopher Columbus, engaged in excursion business between Chicago and Milwaukee, has just finished a very prosperous season. Her total of passengers for the summer of 1900 was 200,000, as against 186,000 last year.

Depth of water at the entrance to Lorain harbor is now 22 ft. The dredge Gen. Meade has been at work there all season for the government and has excavated 115,000 yards of mud and sand. Besides deepening the channel between the piers, a strip on each side of the harbor entrance 500 ft. in width has been dredged.

Col. Wm. P. Anderson, well known to vessel men as chief engineer of the Canadian department of marine and fisheries, has been carrying off great honors at rifle shooting of late. At a recent national prize meeting he won the governor-general's prize, $200 and a gold medal—the big thing of the meeting—which makes him, for this year, the champion rifle shot of Canada.

The steamer Carlo, which hails from Fredericksvaern, Norway, is undergoing boiler repairs at Detroit. Capt. Karl E. Andersen, whose home is in Sandefjord, Norway, says the fresh water is responsible for the accident to the boilers. Capt. Andersen has sailed on salt water as a ship master for thirty-seven years, and during that time has carried every cargo known to commerce, and he has navigated in almost every salt sea. He is thoroughly disgusted, he says, with his brief experience during the present season on the great lakes, though he admits that the venture has been profitable to the Carlo's owners, Blum & Olsen, of Fredericksvaern.

The steel steamer building at the Wyandotte yards of the Detroit Ship Building Co. for the Eddy-Shaw fleet will be launched Saturday afternoon. The new boat has been known as "No. 136," but she will be christened Howard L. Shaw. She is almost an exact duplicate of the steamer Simon J. Murphy, completed and launched June 23 last at the same yards for the same owners. The new ship is 451 ft. long and 51 ft. beam, with molded depth of 28 ft. Engines are triple expansion with cylinders of 22, 35 and 58 in. diameter and 42 in. stroke. It is calculated that 1,500 H. P. will be developed at 165 pounds steam pressure and 85 revolutions of the wheel a minute. The boilers are 13 ft. 2 in. in diameter by 12 ft. long, of the Scotch type, each having two furnaces and using Howden hot draft. The propeller is 13 ft. 10 in. in diameter with 14 ft. 6 in. pitch. It is expected the Shaw will be ready for commission within two weeks after the launching.

NAVIES OF THE WORLD.

Mr. J. Holt Schooling has been writing in the Fortnightly Review on the "Naval Strength of the Seven Sea Powers." In a July article Mr. Schooling's object was to present some better test for comparisons than that which is afforded by mere numbers. He made allowance for the depreciation of navies by age and then listed them after the readjustment according to their fighting weights, taking account of vessels of all classes. Upon this basis the absolute and relative strength was stated to be as follows, the first column of figures representing tons of fighting weight, the second the degrees of strength, with Japan as the unit:

Great Britain	1,347,000	6.38
France	543,000	2.57
Russia	397,000	1.88
United States	349,000	1.65
Germany	282,000	1.34
Italy	218,000	1.03
Japan	211,000	1.00

It will be seen that by this method of estimating values Great Britain is credited with greater strength than France, Germany and Russia combined, and it must interest Americans to know that the United States is a decided gainer because of the discount on old ships. In actual tonnage she ranks sixth, but is sent to fourth place owing to the fact that a relatively large number of her boats are of modern construction. It is manifest, however, that tonnage and date of building are not the only things which determine the effectiveness of a navy, and in a paper which appears in the August Fortnightly Mr. Schooling completes his very exhaustive and painstaking tables, with a comparison of armaments. The calculations are necessarily more complex than the former ones, because of the great variety of guns and the different proportions in which they are employed. There might be several combinations whose merits would provoke a debate among the best trained naval officers, so that it would be perilous to dogmatize upon the subject. But the facts themselves are exceedingly interesting and point pretty clearly to certain general conclusions. From the large number of tables, therefore, there is selected two which contain the most complete, general and comparative summaries, omitting those which go into the details for each class of vessels. The first gives the gun figures in the following form:

	Breech-loading.	Quick-firing.	Muzzle-loading.	Torpedo tubes.	All classes.
Great Britain	912	7,454	340	1,532	10,240
France	471	3,653	...	928	5,052
Russia	393	2,589	...	625	3,607
Germany	258	1,995	...	611	2,864
Italy	140	1,791	4	573	2,508
United States	303	1,791	...	230	2,324
Japan	110	1,168	...	314	1,592
	2,587	20,441	344	4,815	28,187

The second table is computed from the first, and gives an estimate by percentages thus:

	Breech-loading.	Quick-firing.	Muzzle-loading.	Torpedo tubes.	All classes.
Great Britain	35.3	36.5	98.8	31.8	36.3
France	18.2	17.9	....	19.3	17.9
Russia	15.2	12.7	....	13.0	12.8
Germany	10.0	9.8	....	12.7	10.2
Italy	5.4	8.7	1.2	11.9	8.9
United States	11.7	8.7	....	4.8	8.2
Japan	4.2	5.7	....	6.5	5.7
	100.0	100.0	100.0	100.0	100.0

Muzzle-loading guns are out of date, and Great Britain has most of them, but as they are only 340 in her total of 10,240 they are not good grounds for the charge that she is handicapped by an ancient equipment. It will be noticed, however, that her supply of breech-loading guns and torpedo tubes falls below her average for all classes, while this loss is offset by her supply of quick-firing guns. It appears also that she has a larger proportion of big quick-firing guns than any other nation, which is a factor of immense importance. We ourselves are lacking in this particular, but are relatively well supplied with breech-loaders and fairly supplied with the light rapid-firing guns, ranking fourth in the first column and tying Italy for fifth place in the second column. Hence, taking all the factors that have been considered in both papers, we might still be entitled to the rank that was assigned to us in the first of them, and so fall in after Russia and before Germany.

Mr. Schooling extends his investigation to the question of the distribution of arms among the several classes of ships, but it is not necessary to say more on this point than that the high-class ships of the American navy are among the most fully armed of all. For the British reader the discussion will derive its greatest interest from the clear demonstration that the fleet of his country is certainly stronger than those of France and Russia combined.

MOORING DEVICE FOR BUOYS.

In the presence of several army and navy officers, some of whom were connected with the light-house department, tests were made, a few days ago, in the harbor of New York of a new mooring device, designed primarily to keep buoys and light-ships from getting out of position in a storm. The new device is the invention of F. B. Langston, and it resembles in form the mushroom anchor which is used by the light-house department. By means of hydraulic pressure a hole is made beneath the anchor after it strikes bottom, into which it sinks to any desirable distance. The hole is soon filled in, and, on account of its saucerlike shape, the mooring, it is asserted, will be immovable except by means of the same hydraulic pressure with which it was sunk. The tests were made off Ulmer Park. The tug Albert H. Ellis pulled up the new mooring with little difficulty, but those who watched the tests think that with suitable working apparatus the disk can be sunk far enough to resist any tension. Further trials are in contemplation.

BRITISH SHIPPING LEGISLATION.

The past session in parliament has not proved a fruitful one so far as shipping legislation is concerned. With the exception of the Fixed Objects Bill—whereby shipowners and dockowners mutually contract themselves out of unlimited liability in respect of damages done to docks, etc., or suffered by shipping through the negligence of dockowners—the statute book practically remains as it was. This is not to be wondered at, for with such powerful counter attractions as the South African struggle and the conflict with the Chinese, it was hardly to be expected that even the most persistent of shipping legislators could secure serious attention. The tendency in the past has been to over-legislate for shipowners. Such a fault can hardly be laid at the door of the present government. Their weak point lies in the fact that, having resolved upon legislation of a favorable type, they have not had the courage to go far enough. It may be that the role of a government undertaking to legislate on lines intended to benefit the shipowners' business is such a novel one that Mr. Ritchie must have felt a certain amount of nervous modesty in filling the part. However, with practice he may improve, and should he again occupy the post of president of the board of trade, it is possible to conceive that he may give more practical effect to those many sympathetic utterances of his towards shipowners. We allude more especially to the question of the light dues and boy sailors. No fault can be found with the principle of the legislation adoption. The trouble is that the relief afforded to shipowners is not sufficient. And, unfortunately, in legislative action, it is too frequently the case that what is done—is done. When once the legislation is effected, the matter is often a closed book, and we fear that now that parliament has moved in the matter of the light dues it is all too likely that the question will not be re-opened. The attitude of shipowners on the apprenticeship matter, since Mr. Ritchie gave his measure to the world, affords us no reason to alter our contention that the best scheme which could have been adopted—and one which would have afforded the maximum of satisfaction to shipowners and the general public—was that which we suggested on the basis of a total remission of light dues, shipowners undertaking as a quid pro quo that they would carry British boy apprentices on a scale proportionate to the tonnage of their vessels. This scheme, fully enunciated in the columns of the Syren and Shipping, received the hall-mark of approval in shipowning circles. But however desirable such a principle undoubtedly is, it was evidently too drastic a reform to receive the sanction of the government. Still, we feel convinced that it is only by the adoption of such a suggestion that the vexed anomalies of the incidence of the charges for our coastal lighting will be effected. Further, we may point out that the suggested price to be paid by shipowners would settle, once and for all, the question of the foreigner in the British forecastle. The mention of the foreign element in the British mercantile marine recalls the fact that the flag bill, which seeks to debar all save British subjects from commanding or piloting British ships, has not yet emerged from the proposal stage. The stock argument against the suggested measure is that the leaven of officers of foreign nationality serving in the British mercantile marine is so small that it can be ignored as not worthy of legislative regulation. At the same time, the principle cannot be objected to, for it would be utterly illogical to indicate a plan for rendering the forecastle more attractive to the British born and bred citizen, and yet leave the higher grades of the merchant service open to non-British subjects, either by birth or naturalization. The mariners' votes bill is in much the same state as the flag bill; and the scheme under which it is proposed that mariners shall be able to exercise the privileges of the franchise, is of such a clumsy and unsatisfactory character that it is not possible to think parliament can ever give the bill its serious attention. To be quite candid, seagoers themselves are indifferent as to whether or no they can record their votes. The experience of those versed in electioneering matters is that it is exceedingly difficult to induce mariners, who are on the register and at home when an election takes place, to go to the poll. Thus there will be no very general feeling of regret if the mariners' votes bill is never entered on the statute book. We cannot, however, say the same with regard to the under load-line bill. It is altogether unfortunate that South Africa matters should have drawn public attention from realizing the very pressing necessity of preventing underladen vessels from going to sea. The danger of such a practice is as great as general, and the plea of urgency and expediency, on the ground that competition will not allow of any save freight paying cargo to be carried is one that can hardly be received when the issues are considered. Economy is all very well, but economy at the expense of serious risk to life cannot be tolerated. Were the under load-line bill to become law, we feel convinced that shipbuilders and naval architects would soon devise some means of providing the huge modern steam-carrier of today with a sufficiency of accommodation for carrying the necessary water ballast to immerse vessels to a depth which would ensure their safety, even if called upon to make a North Atlantic voyage in the depth of winter.—Syren & Shipping.

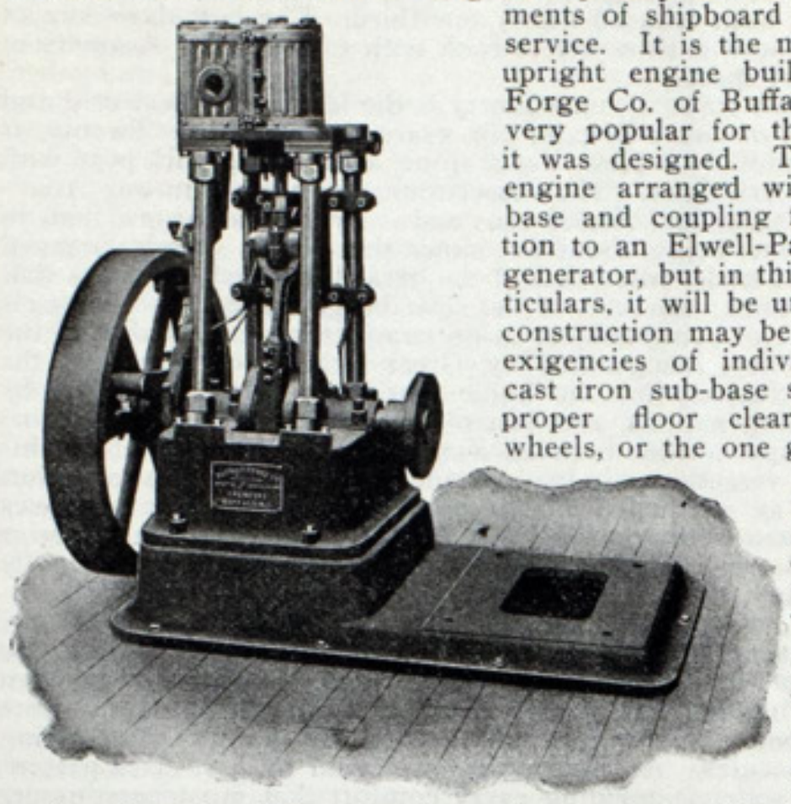
WATER TUBE BOILERS REQUIRE INCREASED SKILL.

Referring to the recent report of the British admiralty to parliament relative to its experience with the Belleville water tube boiler, the Journal of the American Society of Naval Engineers says:

"The paper is full of interest to the naval engineer, and exhibits well the urgent necessity of making engineering knowledge of paramount importance in the personnel of a modern navy. The special merits or demerits of the Belleville boiler have not been fairly presented by the previously published rumors or semi-official reports, and great distortions of the facts have resulted. While it would be only proper for the admiralty to make the best presentation possible of the good points of the boiler it has so extensively adopted, the showing brings into a proper prominence the fact that water tube boilers in general, with the increased rate of evaporation and higher steam pressures, require a greatly increased skill and intelligence in their management. Both in numbers and in technical training the engineer force of naval vessels unquestionably demands increase. This is slowly and expensively dawning upon the higher authorities in the navies of the world. Official reports of facts, when made public as are those in the English report, assist in the earlier consummation of a proper distribution of trained men for such service and in advancing the essential knowledge of engineering to the grades of command where it is needed."

BUFFALO FORGE CO.'S MARINE TYPE SIMPLE ENGINE.

As the building of the main engines for a ship is an art in itself, widely different from the practice that prevails in steam plants ashore, so also are special features required in the various smaller auxiliary engines required for marine purposes. There is illustrated herewith an engine of these smaller sizes which is designed expressly to meet the rigid requirements of shipboard lighting or power service. It is the marine type simple upright engine built by the Buffalo Forge Co. of Buffalo, N. Y., and is very popular for the uses for which it was designed. The cut shows the engine arranged with extended sub-base and coupling for direct connection to an Elwell-Parker Electric Co. generator, but in this, as in other particulars, it will be understood that the construction may be varied to suit the exigencies of individual cases. The cast iron sub-base serves to give the proper floor clearance to the fly wheels, or the one governor fly-wheel when dynamo direct connection is provided. In this case the sub-base serves as a bed for the generator, and may likewise carry the outboard bearing. The form of both sub-base and outboard bearing of course varies with the different makes of generator which it may be desired to connect to the engine. The base, bolted to the sub-base, is cored out so as to combine strength with lightness; it carries the four upright frame rods and, in addition, provides bearings for the crankshaft. The four frame rods are of machine steel, screwed at either end into small cast iron pads and locked with a jam nut as shown. The pads or plates themselves are bolted at the bottom to the base and at the top to the head or cylinder base plate, thus giving a very solid construction. These frame rods combine maximum lightness and rigidity and also afford ready accessibility of parts. In fact, throughout the whole machine an extremely high factor of safety has been preserved. Slight consideration will serve to show that this construction of frame is more than amply sufficient in strength. If we consider simply the vertical axial stress due to the steam pressure on the head, greatest at admission, it will be seen that the stress coming upon each rod in consequence thereof will be but about one-quarter of the stress in the piston rod. The weight of the upper parts, however, must be carried by these rods and they must in addition resist the bending stresses due to guide pressures. But the main reason why a large factor of safety is given these rods is to overcome all tendency of vibration, and this they successfully accomplish.



The cylinder, steam chest and bottom head plate are cast in one piece, the latter carrying the stuffing boxes and affording means for securing the rods. The cylinder is accurately bored and counter-bored and is also provided with indicator connections as shown. Two circular cages or bushings drawn into place in the steam chest form the seats and ports for the piston valve. The piston is cast in one piece and fitted with the usual cast iron snap ring. It is cored very thin to reduce weight, but is thoroughly braced and sufficiently strong for any reasonable strain. The piston rod is of the best machine steel, tapered, ground to fit and bolted to the head by a countersunk nut. At the lower end, the piston rod screws into a crosshead of the marine type. This latter is provided with a single shoe which works upon a guide plate bolted to the frame, as shown in the cut. The engine is designed to run so that the guide pressure will always be taken up by this plate, but two small additional guides are bolted to the main guide plate in such a manner that the crosshead shoe will be enclosed on two sides. The connecting rod at the wrist pin is of the usual marine forked pattern, but at its lower end resembles closely a locomotive end with strap and brasses. A wedge and screw adjustment is here provided for taking up any wear. The crankshaft is a single forging resting in the base bearings, as has already been mentioned, while to the cranks cast iron counter-weighted discs are secured in such a manner as to minimize the shaking forces. The cut shows a coupling shrunk and keyed on one end of the shaft and on the other end the flywheel and governor. This Buffalo governor, by its swinging eccentric controlling the valve travel, possesses many peculiar points of merit, among which may be mentioned constant lead of the valve at all cut offs, and the provision on all the governor pins of oil cups or grease pots for insuring that sensitiveness, ease of running and minimum need of attention so essential for the sustained high speeds of marine service. The eccentric rod at its upper end takes hold of a bottom horizontal extension of the valve rod, which by means of a guide bearing carried from the base of the steam chest is constrained to move in a straight line. A construction much superior to the old rocker arm valve rod motion is thus provided.

In order to render possible high speeds without cessation the greatest care throughout the design must be taken to prevent the likelihood of heating of any parts. For this reason also the lubrication must be superabundant. In this engine special attention has been paid to these most essential features. A multiple oil system is incorporated in this engine. From a large glass-ended oil receiver, situated on the level of the cylinder base, small pipes lead through sight feed devices to each journal or rubbing surface, insuring in this manner the application of the oil to the proper place in the proper quantity. The novel Buffalo Forge Co. system of forced oil circulation, which is an advance step in marine lubrication, may likewise be applied to this engine. With such construction a small oil pump in the base, driven from an eccentric on the crankshaft, acts to take the oil from the crank pit and force it to the receiver above, from which it is distributed through small tubes under a pressure of about 20 lbs. to the various parts needing lubrication, returning then to the crank pit. A light hood, not shown in the illustration, is provided to enclose the crank disc and connecting rod. For oiling the piston and valve a large sight feed lubricator is provided.

This machine is constructed by the Buffalo Forge Co. in sizes up to 65 H.P. The same structural features are embodied in larger marine upright engines of the compound type. The cut of the small engine shown herewith gives a general idea of how the combination of minimum weight and maximum strength and accessibility of the various moving parts is obtained. In the department of marine high-speed lighting service it may not be amiss to mention that this engine has achieved for itself a most admirable record.

SIXTEEN AND A HALF MILLION

TONS OF FREIGHT MOVED TO AND FROM LAKE SUPERIOR TO SEPT. 1—MARKED INCREASE IN SHIPMENTS OF BITUMINOUS COAL—FALLING OFF IN GRAIN MOVEMENT.

Notwithstanding the idleness of one of the largest of the lake fleets of freighters, records of Lake Superior commerce, as reported by officials of both Canadian and American canals at Sault Ste. Marie, show a total of 16,490,020 net tons of freight moved to Sept. 1, against 14,418,477 tons on the same date in 1899 and 12,613,639 tons in 1898. The number of vessel passages on the same date was 12,337 in 1900, against 11,856 in 1899 and 11,029 in 1898; and the registered tonnage of the vessels, 14,319,248 in 1900, against 12,673,275 in 1899 and 11,105,554 in 1898.

Probably the most remarkable gain is in soft coal shipments, which foot up 3,702,959 tons, as compared with 1,810,969 tons on Sept. 1, a year ago, and 2,139,778 tons on Sept. 1, 1898. Hard coal shipments, which amounted to 507,703 tons on Sept. 1, 1899, now foot up only 376,836 tons. Of course there is a large increase in the ore movement, as has already been noted in the reports from shipping docks, but the falling off in grain of all kinds moving from Lake Superior amounts to 7,226,515 bushels. This is due mainly to very light shipments of grain other than wheat. The wheat movement is about 2,000,000 bushels in excess of what it was a year ago, but in corn and other cereals there is a falling off of about 9,000,000 bushels. Following is a complete summary of the canal reports:

MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

ITEMS.	To Sept. 1, 1900.	To Sept. 1, 1899.	To Sept. 1, 1898.
Coal, anthracite, net tons	376,836	507,703	277,131
Coal, bituminous, net tons	3,702,959	1,810,969	2,139,778
Iron ore, net tons	10,818,663	9,062,580	7,714,003
Wheat, bushels	27,005,111	24,825,894	11,514,527
Flour, barrels	3,301,858	3,70[illegible],457	3,503,875

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO SEPTEMBER 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.

ITEMS.	Designation.	To Sept 1, 1900.	To Sept. 1, 1899.	To Sept. 1, 1898.
Copper	Net tons	77,198	63,859	75,567
Grain, other than wheat	Bushels	6,824,151	16,229,883	14,104,367
Building stone	Net tons	19,131	17,778	4,063
Flour	Barrels	3,301,696	3,704,107	3,502,973
Iron ore	Net tons	10,818,663	9,062,580	7,714,053
Iron, pig	Net tons	11,584	15,926	10,215
Lumber	M. ft. b. m.	488,133	588,747	520,725
Silver ore	Net tons			
Wheat	Bushels	27,005,111	24,825,894	11,514,527
Unclassified freight	Net tons	36,364	87,437	145,097
Passengers	Number	21,414	18,408	15,316

WEST BOUND.

Coal, anthracite	Net tons	376,836	507,703	277,131
Coal, bituminous	Net tons	3,702,959	1,810,969	2,139,778
Flour	Barrels	162	1,350	902
Grain	Bushels	18,584	26,500	7,715
Manufactured iron	Net tons	79,637	98,662	149,982
Salt	Barrels	176,734	189,932	178,365
Unclassified freight	Net tons	247,624	239,566	228,521
Passengers	Number	22,529	20,060	18,522

SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

	To Sept. 1, 1900.	To Sept. 1, 1899.	To Sept. 1, 1898.
West bound freight of all kinds, net tons	3,433,946	2,686,443	2,823,396
East bound freight of all kinds, net tons	13,056,074	11,732,034	9,790,243
	16,490,020	14,418,477	12,613,639

	Vessel passages.	Registered tons.
To Sept. 1, 1900	12,337	14,319,248
To Sept. 1, 1899	11,856	12,673,275
To Sept. 1, 1898	11,029	11,105,554

IMPROVEMENTS AT CHARLESTOWN NAVY YARD.

Draughtsmen are now working on the plans for an addition to the rolling mill and anchor shop of the equipment department at the Charlestown navy yard to cost about $100,000, and as soon as the plans are approved bids are to be called for. The building will be built entirely by contractors, the government doing no part of the work. The money necessary for erecting it is already available, having been appropriated by the last congress. The new building will increase the width of the shop from 86 to 180 ft. the entire length, and in addition, an extension 70 by 180 ft. will be built on the eastern end and adjoining both the old and new shops. This will then make the measurements 180 by 281 ft. The ground area will be enlarged by the addition of 32,434 sq. ft., making it nearly treble what it is at present. The addition will be a one-story structure built of brick and granite, over a steel frame, and will correspond in every way with the building now in use. The east end of the shop will be devoted to chain fires, of which there are to be six. At present these fires are in the steam engineering building, and their removal will give that department a large amount of needed room to use for its own machines. A testing machine, which is now in the steam engineering building, will also be transferred to the new shop. In the eastern end will be set up two bending machines, a one-ton Morgan hammer, and two forges with cranes. The equipment department is also to build another new building to be known as an anchor and chain storage shed. It will be erected near the rolling mill. This shed will measure 450 by 60 ft. on the ground and will be one story high. The anchor storage shed will cost about $90,000 and is to be built at the same time as the rolling mill and anchor shop. Besides a storage house, it will serve as a convenient place in which to paint and repair anchors and chains. One of the old wooden ship houses is to be demolished in order to make room for this building.

LAUNCH OF THE WYOMING.

The United States monitor Wyoming was successfully launched from the ship yard of the Union Iron Works, San Francisco, a few days ago, in the presence of thousands of enthusiastic people, lined along the shore or crowded on excursion steamers. About the bows of the vessel a platform had been built for the guests of honor, including Gov. Richards of Wyoming, Adjt.-Gen. Frank H. Stizen, Col. A. P. Hanson and wife, Maj. Thomas Wilhelm, Capt. P. Covert, and Capt. Patrick Sullivan, constituting his staff, and Miss Hattie Warren, daughter of United States Senator Warren, who christened the vessel by breaking the usual bottle of wine and exclaiming, "I name thee Wyoming," as the last supporting props were removed and the monitor started from the ways and slid slowly into the sea. The coast defense monitor Wyoming is one of four similar vessels designed by Chief Naval Constructor Hichborn with a view of securing the greatest results with the least expenditure of money. Her sister ships will be named the Arkansas, Connecticut and Florida. The Wyoming was built by the Union Iron Works, the contract price being $874,000. Her dimensions are: Length on load waterline, 225 ft.; extreme breadth, 50 ft.; mean draught, 12 ft., 6 in.; displacement, about 2,700 tons. The hull is of steel, not sheathed, with double bottom and watertight subdivisions. The hull is protected by a side armor belt ranging from 11 to 5 in. in thickness. The turret is of the balanced type, its armor being 9 in. thick. A conning tower with 7½ in. armor and a single military mast will also appear above the deck. The vessel is to make 12 knots an hour. Her main battery will consist of two 12-in. breech-loading rifles and four 4-in. rapid-fire rifles. In the secondary battery will be three 6-pounder rapid-fire guns and four 1-pounder automatic rifles.

ENLISTED FORCE OF THE NAVY.

Rear Admiral A. S. Crowninshield, chief of the bureau of navigation, will recommend to congress that the enlisted force of the navy be increased to 32,000 men and boys. Should this recommendation be adopted it will mean that the enlisted strength of the service will be increased by 12,000 men. Admiral Crowninshield is absent from Washington and none of the officials can give his views in support of his recommendation. All that is known at the department is that estimates for the fiscal year beginning July 1, 1901, are being prepared for the number of men and boys indicated above. It is believed, however, that Admiral Crowninshield has in mind the additions which will from now on be made to the material of the service. With the number of men now available it is necessary, in order to commission the Alabama and Wisconsin, to place the Indiana and Massachusetts in reserve. The batlteship Illinois will be ready for service within the next six months. The contract date of completion of the Maine class of battleships is June 1, 1901, but it is believed they will not be ready for service before 1902. It is desirable, however, that there should be an ample enlisted force, and Admiral Crowninshield will make every effort to get it. Admiral Crowninshield is also expected to renew his efforts to induce congress to increase the commissioned force by reducing the term of instruction at the naval academy to four years.

The new protected cruisers for the United States navy, to be named the St. Louis, Milwaukee and Charleston, will be in general similar to the Brooklyn, but without the "tumble-home" or sloping sides of the latter. They will be of about 9,000 tons displacement with engines of 20,000 H.P. for a 22 mile speed, or 23,000 H.P. for 23 miles. The bunkers will hold about 7,000 tons of coal. Light armor will protect the broadside guns, and there will be a heavy protective deck. The main battery will probably consist of sixteen 6-in. rapid-fire guns, seven on each side, and one each at bow and stern. There will be no turrets, but all the guns will be protected by shields. It is possible that 8-in. or 10-in. guns may be placed at the bow and stern.

The four-masted schooner Geneva, building at Cobb, Butler & Co.'s yard in Rockland, Me., for John S. Emery & Co., was launched this week. Dimensions of the new vessel are as follows: Length, 169 ft. 6 in.; breadth, of beam, 37 ft. 2 in., and depth of hold, 17 ft. 5 in. Her net tonnage is 776, gross tonnage 874, and her capacity will be about 1,300 tons of coal. She will be commanded by Bjorklund of East Boston, formerly master of the barque Shetland. The Geneva has been chartered to load a cargo of coal at Baltimore for Pernambuco, Brazil.

OUR COAST TRADE.

The fastest steamship time between New Orleans and this city was made last week by the Proteus, the new vessel in the Cromwell line, which steamed from South Pass, at the mouth of the Mississippi, to Sandy Hook, 1,490 miles, in 4 days, 4 hours and 28 minutes. Only a few years ago the regular time of passage between these ports was about six days Thus the time has been reduced nearly one-third. The best day's run of the Proteus, 442 knots, entitles her to rank with transatlantic steamers of the second grade of speed.

The coasting sea trade of our country is the largest in the world and is about twice that of Great Britain, our nearest competitor. Twenty or more lines are centered in New York alone, connecting this port with northern and southern cities. The vessel tonnage engaged in our Atlantic and Gulf coast trade is 2,600,000 tons and is by far the largest item in our merchant marine, being about five times that of the vessels engaged in our Pacific coast trade, twice that of the great lakes and ten times that of our rivers, exclusive, however, of the river barge trade. These vessels have the advantage of being subject to no competition except that of the railroads. The policy, inaugurated by Great Britain, of reserving the coasting trade exclusively for the home marine, has been followed by several of the leading nations, and, last of all, by Russia, whose law forbidding foreign ships to trade between Russian ports went into effect this year. No foreign vessel can ply in the trade between our ports, and thus we have built up an unequaled coasting service, though our deep-sea trade, since the introduction of iron and steel vessels, is still far inferior to that of Great Britain. The vessels in our coasting trade have rapidly increased in number, size, speed and comfort. Ten years ago, for example, the largest vessel in the Savannah line was nearly as large as any vessel in the transatlantic service in 1880. All the improvements that add to the efficiency of the service or the comfort of passengers have been introduced in the newer boats of the various lines and there are no more delightful or cheaper short ocean trips than those on the best boats plying between our coast cities. As a rule, the price paid by first-class passengers in American waters, including every comfort that most persons are able to pay for, is about the same as the higher grade of intermediate fares on the transatlantic lines. This fact has proved to be attractive to those who seek economical vacation sea trips.

In the development of our ocean marine we have no more pressing need than the extension of our splendid coast service to a larger number of the Atlantic ports of Latin America. On the Pacific coast, seventeen ports of Mexico and Central America are reached by the fine steamships from San Francisco. The Buenos Ayres Herald recently mentioned as a regrettable fact that it is still necessary, in order to reach New York in the most comfortable way, to cross the ocean first to Liverpool and then to New York. With the growing development of our South American trade the day can scarcely be far distant when excellent and fast accommodations for travel will be provided between our ports and the leading Atlantic cities of South America.—New York Sun.

A RACING CRAFT.

John S. Newberry of Detroit has purchased on the Atlantic and will bring to the Detroit river for use as a pleasure craft a vessel that has covered a mile of water in the remarkable time of one second less than two minutes. Mr. Newberry bought the boat from a Brooklyn man and gave the fast launch Dawn in part payment for it. The new boat is named the Presto. Its record made in a trial over a measured mile is 1 minute 59 seconds, which is a speed of over 30 miles an hour. Mr. Newberry is now in the east preparing for the cruise home. The boat will appear in the Detroit river before the end of the yachting season. The Presto was built by Mosher at Nyack, N. J., and has been in commission since 1898. Mr. Newberry has had an eye on her since Christmas and recently he made a proposition to A. J. Mollinhaur, her owner, to trade the Dawn in part payment for her. Her dimensions are: Length over all, 80 ft. 4 in.; water line, 75 ft.; beam, extreme, 9 ft. 6 in.; depth, 5 ft.; draught, 3 ft. Her engines resemble in miniature those of a battleship. There are two of them of the quadruple expansion kind, and she has a Yarrow water tube boiler that is allowed 260 lbs. steam pressure. Her twin screws of bronze are each 30 in. diameter and 60 in. pitch. The bunker capacity is about two tons. With all her speed the new craft is beautifully fitted out and has good accommodations. Her upper works and cabin are fitted in mahogany. Mr. Newberry and three guests can sleep aft, while the crew of four have bunks forward. She has also an electric light plant, search light, distilling plant, blower engines, two steam and two air pumps.

NEW STEAMSHIP LINE.

President Spindler of the newly organized Mexican-American Steamship Co., a corporation formed by the Mexican Railway, the Interoceanic Railway of Mexico, the Mexican Central and the Ward Line of New York, who has been attending a meeting of the directors in Mexico, said before leaving New Orleans for New York:

"The Mexican-American will put the manufacturing district of the middle west in direct touch with every Mexican city of any prominence St. Louis will be the greatest beneficiary of the new service, and I will establish my offices there. Already St. Louis does more trade with Mexico than any other city in the United States outside of New York, and in the future I expect to see her giving New York a close race. There are five trunk lines to New Orleans from St. Louis, which will give the benefit of competition, and our connections in Mexico touch every district of any importance. I am going to New York for the purpose of securing steamships for the service, which will be put in operation about Nov. 1. These vessels will be of 1,500 tons each, with first-class passenger accommodations."

Since depression in lake freights set in some time ago, several efforts have been made by owners whose ships are not working under contract to bring about a reduction in wages of men employed aboard the vessels, but executive officials of the Lake Carriers' Association have turned down all such suggestions. They realize that the high wages established last spring, when everything was prosperous, have worked to the disadvantage of vessels not engaged in the ore trade, but they are unwilling to take the chances of labor disturbance that might follow a reduction. On the other hand it is not probable, however, that there will be any haste in making the usual fall advance in wages.

INTERNATIONAL CO.'S SERVICE FROM PHILADELPHIA.

Philadelphia in a short time will increase her facilities for passenger and freight traffic with Liverpool as a result of a change that the International Navigation Co. will make in its line between Philadelphia and the English port in the fall. The company has decided to transfer to its Philadelphia-Liverpool service the two vessels Westernland and Noordland, now running between New York and Antwerp. The two vessels will displace two of those now in the service to Philadelphia. The Westernland and the Noordland, however, are larger and faster, and can thus accommodate more passengers, carry more freight and convey both to their destination faster than any of the vessels the company now has in the Philadelphia service. One of the vessels to be displaced is the chartered steamer Ikbal, which carries only freight. The other will probably be the Pennland. The net result of the change will be that instead of operating four passenger steamers and one freighter between Philadelphia and Liverpool the company will have five steamers carrying both freight and passengers, and the service will be improved generally by the superior character of the vessels transferred.

The Westernland is a vessel of 5,736 tons, and the Noordland of 5,212 tons. They were built in Liverpool, about twelve years ago. Their place on the New York-Antwerp line will be taken by the Vaderland and the Zeeland, two 12,000-ton vessels, building in Scotland, that will be ready for service in six weeks. It is said that the policy of the company will continue to be to increase the accommodations of the Philadelphia line as often as circumstances permit. C. E. Griscom, manager of the Philadelphia office of the International Navigation Co., says of the transfer:

"The Westernland and Noordland will be the fastest boats in the Philadelphia part of the company's service. They will be transferred as soon as possible. Capt. Ehoff, for many years master of the Waesland, of the Philadelphia service, will be assigned to the command of the Westernland. It was planned originally to transfer to this branch of the service the Merion and the Haverford, two 10,000-ton vessels now building in Scotland, but this was found impracticable on account of their too great draught. The company is anxious to increase its facilities in Philadelphia as much as it can and as fast as the conditions of the river will justify it it will do so. The question of the channel is of prime importance in this matter. We had to withdraw, with great reluctance, the Southwark and Kensington from this service because they drew too much water. It is greatly to be regretted that even after the channel has been dredged supposedly to a depth of 26 ft., various causes, which cannot all be explained, have led to shoaling here and there, and we cannot everywhere be sure of our 26 ft. The whole question depends simply on the condition of the channel, and we shall be only too glad to take advantage of every opportunity its deepening and improvement permit to improve the service."

The company's fleet now sailing from Philadelphia is composed of the Belgenland, Pennland, Rhynland, Waesland and Ikbal. The company will continue after as before the transfer to run one vessel a week to Liverpool, but the new boats will give passengers an opportunity of making the run in much better time than has been possible before.

OFFICIAL REPORT ON OREGON'S MISHAP.

Capt. Geo. F. F. Wilde of the Oregon has filed his report by mail with the navy department on the grounding of the vessel in the Gulf of Pe-chi-li last June. The report is as follows:

"I have the honor to report that the U. S. S. Oregon, under my command, grounded upon an uncharted ledge in Pe-chi-li Gulf at 3:05 p. m., June 28, 1900. The ledge has 3½ fathoms over its highest part. Its position is located by sextant angles upon an accompanying chart. The chart shows at this place 17 to 18 fathoms. Preceding the grounding of the ship I have to state that I received urgent orders from Hong Kong from the commander-in-chief to proceed to Taku as soon as ready. This order was dated June 23 and was received the same afternoon. On June 20 a cable was received from the commander-in-chief. The Zafiro arrived at 4:10 p. m. June 23, and the moment men and stores were taken from her the Oregon went to sea, leaving Hong Kong at 6:50 p. m. Weather fine and clear until the 26th, when fog set in very thick. Slowed to half speed. At intervals fog lifted and ship sent ahead full speed. S. E. Promontory light was sighted at 8:14 o'clock on night of June 27; N. E. Promontory light was not sighted, as fog had again shut down. Neither was fog signal heard. Ship was being leaded right along with patent sounding machine. Off Wei-hai-wei the fog lifted for a few moments, just long enough for me to see the flashing light. That was the last absolute fix I had. I judged myself to be off Chefoo by seeing some junks, which are generally seen off that port. A steamer also crossed our bow, evidently bound to Chefoo from Port Arthur. The fog settled down denser and denser. Sounded with patent lead every half hour. When my distance to Howki light had been run down to within ten miles I slowed to 5 knots, and had leadsmen in both chains: also extra lookouts, listening for any whistle echo from any island, or to catch sound of gun from Howki light station. There were fully fifty men stretched along forward on both sides on lookout. Owing to density of fog I remained on the bridge night and day since the 28th; all hands, in fact, were constantly on the alert. The whistle was being constantly sounded, and as there were very light airs there was no reason why the light keepers should not have heard it. I continued on, sounding constantly, until 1:45 p. m., on the 28th, when I began deepening water, from 12 to 13 fathoms, which I had been getting right along, to 17 fathoms. This indicated something wrong, and getting no response to blasts of whistle, I anchored in 17 fathoms of water. Fog very dense. Two whaleboats sounded around ship, but found no obstructions. About forty-five minutes after anchoring, the fog suddenly lifted, and Howki light-nouse was plainly seen, bearing N. 12 W., distant 3 1/3 miles. The chart showing clear water, I got under way at once, headed for Howki light.

"Fog shut down again, very dense, before I got my anchor; but, knowing my position, and orders being urgent, and suspecting no dangers, I started ahead with starboard helm, when the vessel brought up with three distinct thumps. Not until then did the light keepers fire guns; they then fired two guns, according to rule. All water-tight doors were instantly closed. Engines were instantly stopped, but not reversed, as I feared she might sink if backed into deep water. The sea was as smooth as a lake, and I thought I would wait and see if she made water, which she did rapidly in compartments A 3, A 4, A 5, A 33, A 95, A 98, B 80, 13-in. magazine, 8-in. magazine and passing room. At once got out and provisioned all boats; also armed and equipped same. Got over collision mat at once, and at slack water sent diver down and located break. Another diver was procured, very fortunately, from a wrecking expedition some ten miles distant, who located one long break extending a distance of 25 feet on port side forward. The current running at great velocity, divers can only work for two hours at high and low water slack.

"Sent Lieutenant Leigh, navigator, to Chefoo on passing French gunboat Surprise to charter steamers to take ammunition, coal and stores, as ship would have to be lightened to get rock out of side of ship or out of bottom. Two steamers arrived from Chefoo on June 30, which had been chartered by Commander Rodgers, U. S. S. Nashville. Got two 10-in. centrifugal pumps from wreckers. Without them water could not be controlled, as ship's steam pumps could not do so because of the breaking of main drain pipe by rock coming through the side. On July 1, at 11:57 a. m., ship floated, and swung to anchor, which had been laid out astern with 10-in. hawser. Hawser parted, and in order to avoid sinking chartered steamer, could not avoid going aground a second time. Ship rests between two large boulders forward. Diver can see under keel. She shows no signs of strain as far as butts or streaks starting. I shall continue to lighten by taking out more coal and ammunition. Am confident can get ship off. Kure dry dock, Inland sea, is the nearest, and Japanese naval department has offered its use."

The Oregon later, as announced in the Review, was taken to the Kure (Japan) dry dock, where she was temporarily repaired.

NANSEN'S RECORD IS BEATEN.

The Duke of the Abruzzi reached Stockholm last week on his return from the expedition to find the North Pole. He beat Nansen's record and gained a place nearer the pole than was ever reached before. The log of his vessel, the Stella Polaris, shows that after eleven months in the polar ice she drifted to latitude 86 degrees 33 minutes, while Nansen's record was 86 degrees and 14 minutes. One side of the vessel had been crushed in the ice, and it was with difficulty that she was prevented from sinking. Food became very scarce and some of the dogs had to be eaten.

The plan of Prince Luigi Almedeo of Savoy-Aosta, Duke of the Abruzzi, for reaching the North Pole was totally unlike that of Dr. Nansen, who returned in 1896. Dr. Nansen's idea was with his strong ship, the Fram, to try to reach the pole by the open sea, or by drifting with the ice. The Italian, on the other hand, decided not to attempt the last stages of his journey on his ship, the Stella Polaris, but instead, to disembark and traverse the ice northward on sleds. The Stella Polaris carried twenty sleds, each of which was furnished with light storage boxes of aluminum and a canoe. Forty pairs of snowshoes were taken along and forty pairs of ski. Each member of the expedition carried a complete Eskimo equipment, and a suitable amount of scientific instruments and apparatus was taken. The expedition left Christiania on June 12, 1899. The Stella Polaris was provided with 350 tons of coal. Of provisions 250 tons were carried, and 1,500 small packages for individual transportation were packed with food, clothing and equipments, scientific instruments and useful incidentals. The Cavaliere Umberto Cagni, a captain in the Royal Italian navy; Count Quirini, a naval lieutenant, and Dr. Cavalli-Molinelli accompanied the Duke of the Abruzzi on his expedition. Other members of the expedition were two seamen of the Italian navy, four mountain guides, ten Norwegian sailors and one Eskimo to manage the 120 dogs which were taken to draw the sleds.

A MAGNOLIA METAL GATHERING.

A convention of salesmen of the Magnolia Metal Co., at which twenty-five representatives from all parts of the United States and Canada were present, was held at the Murray Hill hotel, New York, on the 6th, 7th, 8th and 10th of the present month, and all subjects appertaining to the sale of Magnolia metal were discussed, the greatest interest in the company's business being manifested. Reports for all concerned showed that the company's business had never during the past fifteen years been so prosperous as during the last year and a half, and that the prospects for the future are far better than ever before. The utmost enthusiasm was shown by all the men for the future of the company's business, and the affair wound up by the presentation of a loving cup to Mr. E. C. Miller, vice president and general manager of the company. Cables and telegrams from the conference were sent to the London, Paris, Berlin, St. Petersburg and San Francisco offices of the company, and to a number of absent salesmen who could not be present.

The navy department has awarded a contract for the installation of an electrical conduit system at the Washington navy yard to George W. Ledie of Philadelphia, at his bid of $15,246.

The Nickel Plate road announces to the public that Euclid avenue station, Cleveland, is now open for all trains. Passengers may now secure tickets and have baggage checked for all trains east or west bound at this station. 204, Oct. 7.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of September 12, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	36⅝	37	36½	36½
American Steel & Wire, Pfd.....	75	75½	75	75¼
Federal Steel	34¾	35¼	34¾	35⅛
Federal Steel, Pfd.....	67	.....	.....	67
National Steel	26½	.....	.....	26½
National Steel, Pfd.....	.....	.....	.....	.....
American Tin Plate	28⅜	.....	.....	28⅜
American Tin Plate, Pfd.....	.....	.....	.....	.....
American Steel Hoop.....	19⅞	.....	.....	19⅞
American Steel Hoop, Pfd.....	67	.....	.....	67
Republic Iron & Steel	12¼	.....	.....	12¼
Republic Iron & Steel, Pfd	54	.....	.....	54

TRADE NOTES.

The Bethlehem Steel Co. received on Sept. 1 a telegraphic order for a port propeller shaft to replace one which broke in the Plant line steamer La Grande Duchesse while off Halifax recently. The owners of the vessel specified that the shaft should be made of fluid-compressed open-hearth steel, forged under hydraulic pressure, annealed and rough turned, and the order was booked for shipment Sept. 11. The shaft measured 32 ft. over all by 13¼ in. diameter, and the shipping weight was 15,458 lbs. It was taken in hand under emergency instructions and went forward Sept. 6, five days in advance of requirements.

Tests of the large marine railway recently built by H. I. Crandall & Son of East Boston, Mass., for the Townsend & Downey Ship Building & Repair Co. of New York have proven highly satisfactory. Last week the steamer Westburn of 3,320 tons was hauled out with most gratifying results to both parties. Messrs. Crandall & Son have just started, for parties in San Francisco, a railway of 3,000 tons. They are about to close contracts for two railways at Norfolk, Va.—one of 3,000 tons and the other of 1,000 tons. They have recently sent railway machinery to Greenport, L. I., for a railway being built there for the Greenport Basin & Construction Co., and they have also recently submitted designs for a steel side-haul marine railway of 1,000 tons capacity to a steamship concern at Sarepta, on the Volga, Russia.

Ambitious mechanics who desire to obtain better positions and higher wages should investigate the many advantages afforded by the correspondence method of instruction in the theory of the trades and engineering professions. Without leaving home or losing time from work the student pursues a thorough course of study under the direction of able instructors who are always ready and willing to assist him. Instruction papers, prepared especially for teaching by mail, are furnished free. These papers, written in clear and concise language, as free as possible from technicalities, are much superior to ordinary text-books on the subjects of which they treat. In addition, special information regarding any difficulties in their studies, is furnished students without extra charge. It should be the ambition of every man to advance in his trade or profession. A mechanic with practical experience, supplemented by theoretical education, can command a better position than a man without such an education. The results of long experience in teaching by mail show that no other method so fully meets the requirements of men who have but little time for study.

Syren & Shipping of London contains the following notice of an American product: "A pneumatic hammer, which only needs knowing to secure a great demand on this side, is that manufactured by Messrs Thomas H. Dallett & Co. of Philadelphia. One of the drawbacks to this class of tool in the past has been the jar communicated to the hand and body of the operator, but this is entirely overcome by the tool introduced by Messrs. Dallett & Co. The hammer is of the 'valve long stroke type,' the valve being of substantial design, and not liable to break. The handle is firmly fastened to the body by a collar locking nut, which can be easily removed, and all working parts are made of steel, carefully hardened and accurately ground to gauge, thus ensuring durability and long wear. The handle has a pistol grip, and the admission valve is so designed that the operator has an instant and sensitive control of the strength of the blow he wishes to strike; so that even with the largest size he can instantly change from the full power of the hammer to the lightest cut desired. The hammers are made in three sizes, weighing from 10 lbs. to 12½ lbs., and consuming from 15 cub. ft. to 21 cub. ft. of air."

DENIALS FROM MESSRS. CARNEGIE AND SCHWAB.

The newspapers have lately been filled with reports of dissensions in the Carnegie Steel Co. There is not even a grain of truth in any of them. Mr. Carnegie says that the company is a harmonious and happy family. Discussing the subject in London, President Schwab of the Carnegie company said:

"It's a mystery to Mr. Carnegie, as well as to his associates, how the recent wild stories originated. There is not a shadow of truth on which to base them. Such a thing as my retirement from the presidency, for example, was never even broached at Skibo castle, and as far as my own visit there is concerned, I had not seen Mr. Carnegie for over four months and our meeting was simply a conference regarding current business matters, principally in connection with certain improvements to our properties."

Commenting on the steel situation and general trade conditions, Mr. Schwab said: "When I left America in August, business was better than it had been for months previous, with a promise of still greater improvements. Prices, depressed from natural causes, were rising again through the operation of the same agencies."

Mr. Schwab declared that American steel and iron had a powerful ally in American coal. "The market for our steel and coal," he continued, "is widening the world over, and when to this there are added the natural advantages which have enabled us to invade the foreign market and force foreign competitors to buy our coal, our status as a manufacturing nation is still further assured. The European demand for American coal, if it does nothing else, will have served a useful purpose in opening our eyes to the need of extending our merchant marine. If we fail to get our full share of the world's trade it will be because we have not enough ships to carry the goods we sell. The Hanna-Payne shipping bill is a move in the right direction, and in the meantime individual shipping competition will afford additional facilities; for if the freight rates continue high traffic will offer such inviting profits that more and more vessels will be bound to enter the carrying trade."

The Tampa Steam Ways, Tampa, Fla., was burned out last week. The loss on the ship yard is estimated at $45,000.

WITH THE ATLANTIC COAST BUILDERS.

A NUMBER OF NEW CONTRACTS ARE TO BE NOTED — PROGRESS OF CONSTRUCTION.

The work of stepping the masts of the army transport Kilpatrick was begun at the Erie basin, Brooklyn, a few days ago. Instead of the four she formerly carried she will now have but two. These have been cut apart and lengthened about 35 ft. each, making them about 130 ft. in length from the steps to the trucks. A large new donkey boiler has also been installed. The work is being done by the Monarch, the most powerful derrick of the Chapman-Merritt Wrecking Co. The stepping the masts was regarded as being especially difficult, owing to their great length and to the fact that the ship stands very high out of the water. Business is rushing at the Erie basin just now. There is a large force of men on the Kilpatrick and the work of making temporary repairs on the burned Bremen of the North German Lloyd line has been commenced. At present these repairs are being largely confined to the pipe work of the ship. Only temporary repairs will be made on the Bremen in this country. She will be permanently repaired, and probably lengthened, in Germany.

A contract has just been awarded the Bath Iron Works, Bath, Me., for the construction of a powerful steel ocean-going towboat for the Staples Coal Co. of Taunton, Mass., which will probably be the largest and most powerful tug in the United States. The Staples company now has a fine fleet of double-stacked vessels in the trade to Boston. The fleet comprises the Tacony, Waltham, Concord and Eureka, while the government tug Osceola was previously owned by the company and named Winthrop. The new craft will cost about $100,000 and be nearly as large as the gunboat Vicksburg, building at the same yard. Her length will be 165 ft., 29 ft. beam and 19 ft. 3 in. deep. This will be 7 ft. longer than the Philadelphia & Reading tug Gettysburg, one of the biggest in the trade. The new tug will have same beam as the above vessel and will have a greater depth by 1 ft. 3 in. She will have engines with over 1,300 H.P., or more than the Gettysburg and Gypsum King.

The Pusey & Jones Co., Wilmington, Del., has received a contract for a steel hull steam lighter for service at the League island navy yard. The boat will be 100 ft. long, 93 ft. long between perpendiculars, 28 ft. wide and 9 ft. deep. The deck house will be of steel, 32 ft. long, 11 ft. wide and 6½ ft. high. She will have a steel derrick mast and boom, capable of lifting six tons, and two steam hoisting engines to operate over the two hatches. The vessel will be propelled with a fore-and-aft surface condensing engine of 200 H.P. The cylinders will be 13 and 26 in. in diameter, with an 18-in. stroke. The boiler will be of the Scotch type, 10 ft. long and 10 ft. in diameter, built to sustain a working pressure of 125 lbs. to the square inch. The boat is to develop at least 8 knots an hour and will be used as a lighter for ordnance purposes at League island yard. It will have all conveniences, such as steam heat, air and circulating pumps and improved lighting facilities.

The new whaling schooner, Joseph Manta, now building at Essex, Mass., will be 100 ft. over all, 24 ft. beam and 9½ ft. depth of hold. This new schooner, which is an ideal of her type, will have all of the requirements of a modern whaler. She was designed by McLain of Gloucester and is being built by Tarr & James. She will hail from Provincetown. After her completion she will be taken to New Bedford, where she will be fitted out for a three years' voyage in the Atlantic.

The last business act performed by the late Arthur Sewall of Bath, Me., was when, three days before his death, he signed a contract for materials to be used in the construction of the largest steel schooner in the world. The schooner will be a four-master and will cost $180,000. Work on the vessel will begin in December. She will be 351 ft. over all, 323 ft. keel, 42.2 ft. beam and 28.9 ft. deep.

The Harlan & Hollingsworth Co., Wilmington, Del., has received a contract to build a steamship 325 ft. long for Henry G. Knowlton, who is interested in the New York & Porto Rico Steamship Co. It is to be used for freight purposes.

One of the barges for the Rockland-Rockport Lime & Cement Co. was launched from the yard of Harlan & Hollingsworth Co. last week. There is another one under construction for the same company.

U. S. Engineer Office, 185 Euclid Ave., Cleveland, O., August 21, 1900. Sealed proposals for Stone Reinforcement and Repair of Jetties at entrance of Port Clinton Harbor, Ohio, will be received here until 2 o'clock. P. M., standard time, September 21, 1900, and then publicly opened. Information will be furnished on application. Jared A. Smith, Col., Engrs. Sept. 20.

U. S. Engineer Office, Jones Building, Detroit, Mich., Sept. 13, 1900. Sealed proposals for removing wreck of schooner "Leader," near head of Belle Isle in Detroit River, Mich., will be received here until 12 noon, standard time, Sept. 24, 1900, and then publicly opened. Information furnished on application. G. J. Lydecker, Lt. Col., Engrs. Sept. 13.

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FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas)..... Philadelphia.
Graham, James & Co.....Detroit.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co..Buffalo.
Smith, Stanley B. & Co.....Detroit.
Scott Co., W. L.....Erie, Pa.
Youghiogheny & Lehigh Coal Co.. .....Chicago.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.
Giddings & Stevens.....Rockford, Ill.
McMyler Mnfg. Co..... .....Cleveland.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, POWER DROP.
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

HEATING APPARATUS.
Sturtevant Co., B. F.....Boston.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting & Conveying Mach. Co..Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co..... .....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co..... .....Cleveland.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mnfg. Co.... ...Pittsburg.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.
Jenkins Bros.....New York.
Penberthy Injector Co.....Detroit.

INSURANCE, MARINE.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys..... .....Milwaukee.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn & Co., F. H..... .....Chicago.
Pauly, H. J.....Milwaukee.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

LAUNCHES—NAPHTHA, ELECTRIC.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.

LUBRICATING PUMPS.
Phenix Metallic Packing Co.....Chicago.
Sterling Lubricator Co.....Rochester, N. Y.

MACHINE TOOLS.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.

MACHINE TOOLS (WOOD WORKING).
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.

NAVAL ARCHITECTS.
Curr, Robert.....Cleveland.
See, Horace.....New York.
Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.
Bethlehem Steel Co.....So. Bethlehem, Pa.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Jos.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A..... .....So. Boston.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

PLUMBING, MARINE.
Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.
Kenney, The Co.....New York.

PNEUMATIC TOOLS.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co..... .....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co.....Weymouth, Mass
Hardy, John B..... .....Tacoma, Wash.
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.

PROJECTORS, ELECTRIC.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Kingsford Foundry & Machine Works..... .....Oswego, N. Y.
Van Duzen, The E. W. Co.....Cincinnati.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Cleveland Punch & Shear Works Co.. ...Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER INSULATED WIRES.
Roebling's Sons, John A..New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SCHOOLS, CORRESPONDENCE—ENGINEERING AND NAVIGATION.
International Correspondence Schools.....Scranton, Pa.

SCREW MACHINES.
Niles Tool Works Co.....Hamilton, O.

SEARCH LIGHTS.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

SEPARATORS, (CENTRIFUGAL).
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

SHAPERS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co .Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co..... .....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Marine Supply Co..... .....Fairport Harbor, O.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEEL OR IRON STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.

Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co. .....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.

Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.

Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.

American Bridge Co.....New York.

SURVEYORS, MARINE.

Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

TELEGRAPH—DECK AND ENGINE ROOM.

Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.

Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THERMOMETERS FOR MECHANICAL PURPOSES.

Helios-Upton Co.....Peabody, Mass.

TIMBER—LARGE PIECES.

Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co. ...Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

TOOLS, WOOD WORKING.

Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

TRUCKS.

Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.
Playfair's Barge & Tug Line.....Midland, Ont.

TOWING COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING FOR BOILERS.

Atlantic Tube Co.....Pittsburg.
Shelby Steel Tube Co.....Cleveland.

TUBES, SEAMLESS DRAWN, BRASS AND COPPER.

Hungerford Brass & Copper Co., U. T.....New York.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.

Smith, Edward & Co.....New York.

VARNISH PAINT.

Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Bull & Co, A. H.....New York.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.

American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

WINDLASSES.

American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.

Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

WORM GEARING.

Morse, Williams & Co.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.

Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

YAWLS.

Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.

WANTED FOR SALE, FOR CHARTER Etc.

Space under this heading 25 cents a line, each insertion, for three insertions or less. Special rates for periods of more than three insertions.

—FOR SALE—Two tugs, one of 65 ft. keel with engines 20x22 and the other of 61 ft. keel with engines 20x20. Ranney Bros., 34 River st., Cleveland. Sept. 13

—WANTED—Marine boiler of about 6 by 11 ft. High steam. J. M. Clow, Marinette, Wis. Sept. 12

—MECHANICAL engineer with large experience in marine and stationary engine and boiler work, as well as electrical work, is open for an engagement as manager or superintendent and chief draftsman of works. Highest testimonials. Address Box A, Marine Review Pub. Co., Cleveland. d

—FOR SALE—Double-cylinder 10 H. P. gasoline engine which develops a good 12 H. P. and is capable of driving a 40 to 45-ft. launch with the current at a speed of 12 to 15 miles, or against current from 8½ miles up. The engine is of the latest approved pattern and is reversible; has water heads and is as good as any marine gasoline engine ever made; can be reversed from bow of boat by simply pressing a button; cost $900; will sell for $550, f. o. b. Winona. Address Emil Leicht, Winona, Minn. Sept. 13

—FOR SALE—Good tug, six years old. Engines 18x20. Boiler allowed 130 pounds steam pressure. Address Box 284, Ashland, Wis. tf

—FOR SALE—Marine boiler of 6½ by 12 feet. Allowed 110 pounds steam. Never been cut. Also breeching smokestack and grates. E. E. Koch, Sandusky, O. Sept. 21.

—FOR SALE—Scotch marine water-back boiler; 7 feet diameter, 11 feet long; dome 30x30 inches; furnace 40 inches diameter; 69 3-inch tubes, 8 feet 6 inches long. Built under government inspection and just completed. Price $2,000. F. O. B. cars Minneapolis. Address Nicollect Island Boiler Works, Minneapolis, Minn. tf

MARINE REVIEW

VOL. XXII. CLEVELAND, O., SEPTEMBER 13, 1900. No. 11